ELECTRICAL REVIEW

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VIEWS, NEWS AND INTERVIEWS.

Mr. Charles H. Thrall, manager, superintendent and electrician of the Compañia Electrica de Regla y Guanabacoa, whose plant is at Regla, across the bay from Havana, has returned from Cuba after successfully performing a perilous and important mission for the United States Government. Mr. Thrall was picked up at Bacuranao, on the Cuban coast, seven miles east of Havana, by the gunboat "Wilmington," on May 3. The next day Mr. Thrall was transferred to the flagship "New York," and made his report to Admiral Sampson in person. On the day after General Lee arrived at Key West, Thrall went to Havana in a sailing ship and has been there ever since acting as a government agent. His report contained the first authentic news from the beleaguered city that has been received since Admiral Sampson's blockade has been in effect. When Thrall's mission had been completed he left Havana disguised as a cattle-drover, and successfully made his way to the coast, where he was picked up by our gunboat.

In various parts of the country, as horse cars have gone out of use, supplanted by larger cable and trolley cars, they have been sold and put to odd uses. They have been used for dwelling purposes and as children's playhouses and so on. In New York city, says a daily paper, in the upper part of Manhattan Island, there are two old horse cars placed side by side to serve as a restaurant. The sides of the two cars where they join have been taken off entirely, making the interior of the two cars into one open space. The effect is novel and striking, but not so much so, perhaps, as the sign on the side of the car which catches the eye of the beholder as he passes on: "Ladies' and Gents' Dining Car."

One of the rear wheels of a Bellevue Hospital ambulance came off the other morning while the ambulance was answering a call. Driver Searles signaled a south-bound under-trolley car and he and Dr. Nutt boarded it. The car ran without a stop to Fourteenth street, where a man had been stabbed in the head and was bleeding badly from a severed artery. It is thought that the man's life was saved by the use of the trolley car. He was taken to the hospital in another ambulance and will recover.

The electrical developments in Mexico, from the various reports, would indicate that the demand for electrical apparatus and machinery is liable to increase extensively at an early date.

"Cap" Byers, an Austrian toolmaker in the employ of the Westinghouse Electric and Manufacturing Company at East Pittsburgh, was heard to say that he hoped all the American warships might be blown up as the "Maine" was. Byers was discharged, and several hundred men looked for him all about the village of Turtle Creek armed with pots of tar and bags of feathers.

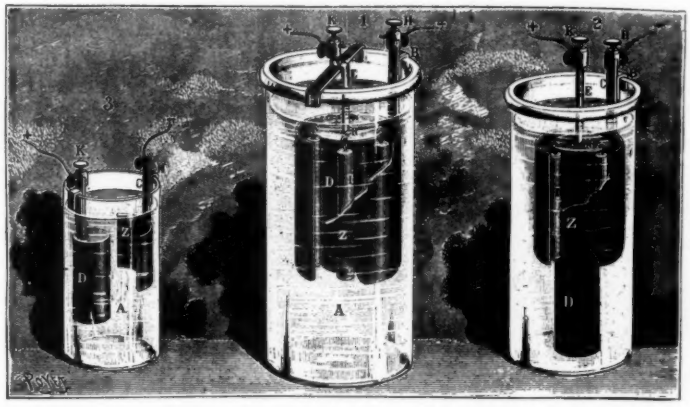
The Hudson River Power Transmission Company, of Mechanicsville, N. Y., is now placing the dynamos at the new dam. One of the three already set measures 14 feet high and has a capacity of 1,000 horse-power, and the others 100 horse-power each.

An official of the New York Telephone Company states that the use of the telephone has increased to such a remarkable extent that it is revolutionizing business in every direction. The orders to put in telephones on May 1 have never before been so large, and are taxing the capacity of the company to the utmost.

In Germany there are now 690 localities provided with facilities for long-distance telephony. Berlin is in telephonic connection with 415 towns in and outside the empire, Leipsic with 128, Cologne with 119, Hamburg with 114, Karlsruhe 105, Dresden 98, Hanover 97, Frankfort-on-Main 91 and Magdeburg 74.

George A. Fowler, president of the Fowler Packing Company, of Kansas City, has given Kansas University a gift of $18,000 for the erection of new electrical engineering shops, to take the place of those destroyed by fire some weeks ago. The building will be erected by Mr. Fowler as a memorial to his father. Plans and estimates will be drawn at once, and the building completed and new machinery put in before the Fall term opens in September.

Mr. Charles J. Glidden, for the past two years the vice-president of the Erie Telephone and Telegraph Company, has been chosen to fill the office of president. Mr. Glidden is well and favorably known throughout the business and financial world from his long connection with telephone interests. For over 20 years he has been an energetic and successful manager of telephone companies.



NEW ARRANGEMENT OF THE DE LALANDE OXIDE OF COPPER BATTERY.

Oxide of Copper Batteries.

The De Lalande oxide of copper battery, which is well known to electricians, is now widely used, and more than 500,000 elements have already been employed. This battery, in fact, does not wear away in open circuit and uses the products only in proportion to the energy furnished. It has, moreover, the advantage of giving a constant intensity.

The last styles of this battery contained a zinc electrode forming the negative pole, a disk of agglomerate of oxide of copper forming the positive one, and a 30 or 40 per cent solution of potassa. The generating reaction of the current is as follows: When the circuit of the battery is closed the water is decomposed. The oxygen proceeds to the zinc, which combines with the potash to form a very soluble zincate of the latter, while the hydrogen reduces the oxide of copper to the metallic state.

M. De Lalande, without changing the constituent elements of his batteries, has just introduced a certain number of improvements into their practical arrangements and a few simplifications that reduce the net cost. The oxide of copper is now placed in cylindrical boxes of perforated sheet-iron and surrounded with a porous material of very feeble resistance. In this way deposits of copper upon the zinc are avoided. A few new arrangements have likewise been introduced into the form of the zinc. One of the principal peculiarities is the method of dissolving the potash. This product, placed in tin boxes, is, when the battery is in use, suspended from the top of vessels filled with water. The water enters these boxes, which are provided with a perforated bottom, and very quickly dissolves the caustic product. The result is the formation of a thick solution which falls to the bottom of the vessel. The liquid is then mixed and the pile is ready to operate.

The new arrangements adopted are shown in the accompanying engraving, which is reproduced from *La Nature*. In No. 3 is represented a small-sized element, of which the total height is eight inches and the

diameter four. This style is capable of furnishing 75 ampere-hours. Its electro-motive force is 0.8 volt and the normal tensity is one ampere, but it is capable of giving from two to three amperes upon very feeble resistances. The zinc Z is suspended by a hook H from the edge of a vessel opposite the oxide of copper cylinder D.

The style shown in No. 1 is the largest size. Its height is 14 inches and its diameter seven. It is capable of furnishing 600 ampere-hours at an intensity of from five to six amperes, and even a discharge of from 15 to 20 amperes. The zinc cylinder Z is suspended from the edge of the vessel A by a hook B and is provided with a strip C carrying a terminal H. In the center there is an oxide of copper cylinder held at a distance from the zinc one by four porcelain insulators I. The zinc cylinder is connected with a strip E, which rests through an elbow upon a cross-piece F and carries a terminal K.

The medium-sized battery represented in No. 2 has sensibly the same arrangements. The oxide of copper cylinder D rests here upon the bottom of the vessel. This element, which is 13 inches in height and six in diameter, has a capacity of 300 ampere-hours and is capable of furnishing from three to four amperes in a normal operation.

Such are the new arrangements of the De Lalande battery, in which the drawback to the use of potassa is greatly diminished by the recent improvements. It remains the sole type of a primary battery of large discharge that does not wear away in open circuit. All the parts are so calculated as to wear away at the same time.

This battery is much employed for actuating induction coils and for the ignition of gas and gasoline motors. One battery will actuate for a year an induction coil operating 10 hours a day. It likewise renders great services in all cases where there is needed a source of feeble electric energy for constant or intermittent use.—*Scientific American.*

Mount Lowe Searchlight for San Francisco.

It was reported last week that the Government had leased the electric searchlight at Mount Lowe. It will be mounted at San Francisco and used at night over the bay in connection with the fortifications. It is said to be the largest searchlight in the world. It is ten feet six inches in diameter and weighs about 6,000 pounds. The mirror used in the projector is five feet in diameter.

A NOVEL FORM OF THERMO-ELECTRIC BATTERY.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK, APRIL 27, 1898, BY C. J. REED.

If further proof were needed of the very high thermo-electric power of metals in contact with electrolytes, a very striking and conclusive proof may be found in the following experiments.

The apparatus consists of a fused mass of caustic potash or soda, maintained at a temperature of 500 degrees to 800 degrees centigrade, into which two conducting rods are inserted, both of the same metal and as nearly alike as possible in every respect except form. One of the rods, marked B in Figs. 1 and 2, is of cylindrical form. The other, marked A, is in the form of a cylinder having a deep recess cut or turned out near one end, leaving at the end a short cylindrical head attached to the rod by a very narrow stem.

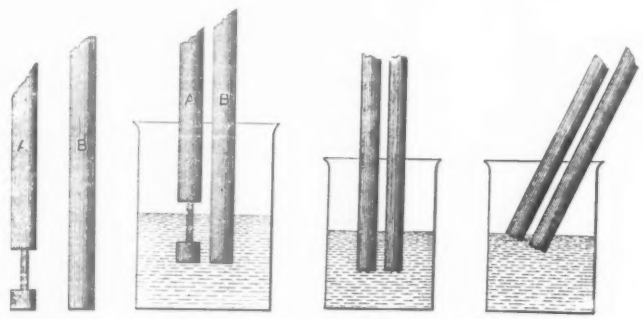


FIG. 1. FIG. 2. FIG. 3. FIG. 4.

DIAGRAMS ILLUSTRATING "A NOVEL FORM OF THERMO-ELECTRIC BATTERY."

In order to obtain two pieces of metal having, as nearly as possible, the same molecular structure and chemical composition, a uniform rod of Bessemer steel, five-sixteenths of an inch in diameter and two feet long, was cut in two equal parts. The severed ends, which were originally together at the middle of the rod, are turned smooth and flat to form the lower or contact ends of the rods A and B, shown in Figs. 1 and 2. The head formed on the end of A is one-quarter of an inch long, and the stem by which it is attached is half an inch long and one-twentieth of an inch in diameter. The two rods thus prepared are held parallel to each other and about one-quarter of an inch apart in a wooden clamp, with their ends in the same plane at right angles to their axes.

The rods are now inserted in a vertical position to a depth of one-half an inch into the fused caustic alkali. The surface of the fused alkali should come above the head of the rod A, but not above the stem, as shown in Fig. 2. The cup used in this experiment to hold the molten alkali is of sheet steel, about two inches in diameter and three inches deep. The rods are inserted in the center of the cup, in order that the temperature and chemical composition of the mass of alkali immediately surrounding the rods, as well as the temperature of the air surrounding them, may be as nearly homogeneous as possible. By these precautions all effects of every nature are eliminated, except such as may be due to the difference in temperature between the submerged ends of the two rods, caused by their difference in form, which enables the rod B to get rid of its communicated heat by conduction more rapidly than the rod A. The temperature of the alkali is maintained at about 700 degrees centigrade. After the rods have remained in the melted alkali a few minutes and the room has been darkened, they are quickly withdrawn for inspection. The cylindrical head on the rod A is seen to be at a uniform bright-red heat, while the rod B is only perceptibly dull red at the extreme end. The difference in temperature between the cylindrical head of A and the hottest part of B is probably not less than 100 degrees centigrade. The reason for this difference in temperature is apparent. The narrow stem of A conducts heat away very slowly, while the rod B, of uniform diameter, conducts away its heat with a rapidity many times greater. Assuming that both rods receive heat from the surrounding liquid initially at the same rate per unit of surface, the head of rod A must become much hotter than any part of B, since it has a relatively larger surface of contact with the communicating liquid and loses its heat by conduction much more slowly.

In this arrangement we have two pieces of metal as nearly alike as possible in chemical composition and molecular structure, subjected to the same conditions in all respects, except that the temperature of one at its junction with the electrolyte is higher than the temperature of the other at its junction with the electrolyte. In other words, the electrolyte has one hot and one cold junction with pieces of the same metal inserted in it to the same depth and subjected, as far as known, to no other disturbing influences.

This arrangement gives an electromotive force, varying with the temperature and constitution of the electrolyte, between—0.2 volt and +1 volt. The difference in temperature between the two junctions evidently increases with the temperature of the fused alkali, being zero when the temperature of the communicating liquid is the same as that of the surrounding air. The difference in temperature between the junctions increases rapidly for a certain period from the beginning of the experiment, while the rod B is comparatively cold and capable of dissipating heat rapidly and while the temperature of A is rapidly rising. Following this will be a period during which the difference in temperature between the junctions will diminish until both rods attain throughout their entire lengths the maximum temperatures they are capable of attaining under the conditions.

I have previously shown some of the peculiar variations of electromotive force under changes of temperature and alterations in the constitution of the electrolyte, which are exhibited in a cell consisting of an iron cup containing fused alkali as one electrode and an iron or other conducting rod inserted in the alkali as the other electrode. In that apparatus the iron cup imparted heat to the alkali and the alkali imparted heat to the rod. From this circumstance it follows that the junction of the electrolyte with the iron cup is necessarily hotter than the junction of the electrolyte with the rod. The cup, being the hotter of the two pieces of iron in that experiment, should act in the same qualitative manner as the rod A in the experiment illustrated in Fig. 2 above, A being the hotter of the two rods. But the difference in temperature between the two rods, A and B, can never be as great as the difference between that of the heated cup and that of the rod B.

These conclusions are entirely confirmed by the experiment, the rod A acting in the same manner as the cup, with the exception that the electromotive force obtained from it is not so great.

In attempting to explain the electro-motive force developed between the heated cup and the inserted rod as a result of chemical action, some have resorted to the argument that the upper layers of the liquid may have an affinity for iron different from that of the lower layers, assuming that oxidation of iron in the upper layers causes reduction of iron in the lower layers and at the same time evolves electrical energy. The experiment with the two rods inserted to equal depths evidently leaves no room for such an argument, aside from its inherent absurdity. As a matter of fact there is no evidence of the existence of any such layers of varying chemical composition, the entire mass being continually stirred up by rapid convection currents like boiling water. The same results are obtained even when the rods extend to within a milli-

metre of the bottom of the cup. I have also obtained an electro-motive force of nearly one volt between the cup and an inserted iron rod, when the rod actually rested on the bottom of the cup, metallic contact being prevented only by a thin film of oxide or of the electrolyte.

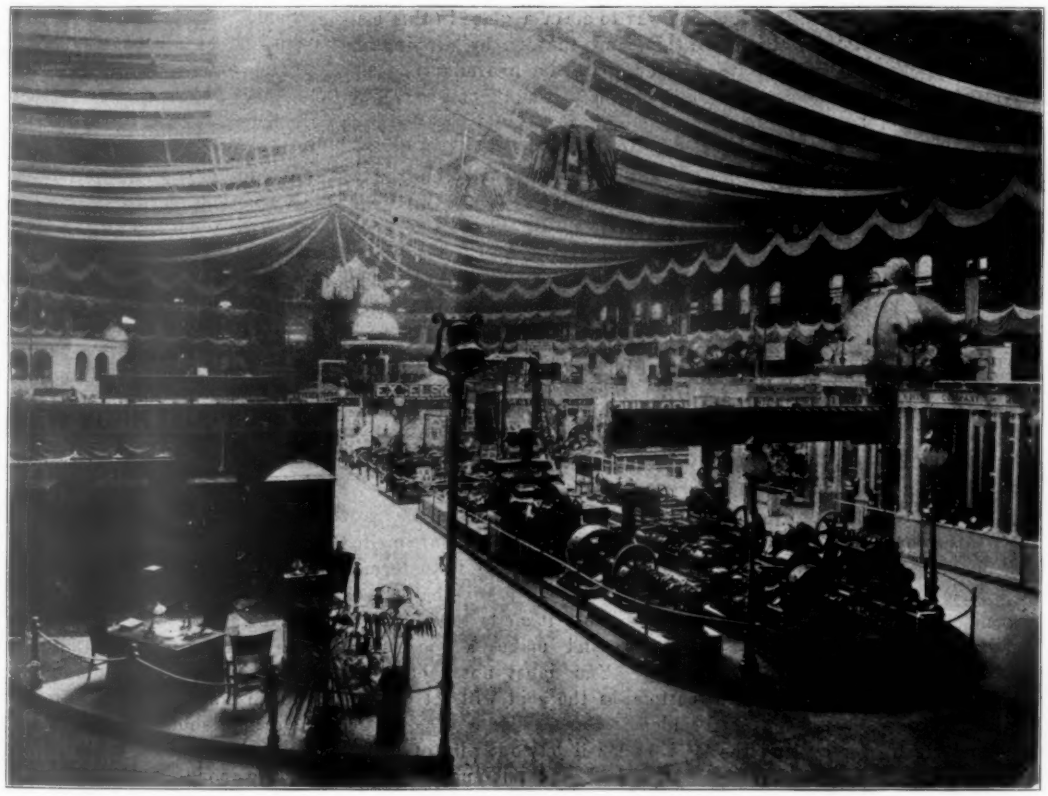
Admitting that the chemical affinity between hot iron and the electrolyte is undoubtedly different from that between cold iron and the electrolyte, no energy could be evolved in any form due to this differential affinity, except energy derived from the heat of the furnace, since the existence of this differential affinity depends only upon the difference in temperature. To suppose that the electrical energy of this cell is derived from chemical action involves the assumption that iron has a greater affinity than iron for oxygen, or that oxygen will select and combine with one of two similar pieces of iron while it dissociates from the other, and the further assumption that such a process will evolve energy. If this is possible, it can be possible only because of the difference in temperature, which in turn can be maintained only by a constant expenditure of heat from the furnace. Otherwise we should have an inexhaustible source of energy.

If oxygen can evolve energy by leaving one piece of iron and combining with another, it may, with equal reason, leave the second and recombine with the first, evolving an equal amount of energy, and there would be no limit to the number of such reversals, all evolving energy.

The experiment shows that the rods A and B evolve electrical energy and exhibit a high electro-motive force under circumstances that are identical in all respects except temperature, and that the action is therefore thermo-electric.

(To be continued.)

THE ELECTRICAL CASCADE AT THE ELECTRICAL EXHIBITION, MADISON SQUARE GARDEN, NEW YORK CITY.



A VIEW OF THE ELECTRICAL EXHIBITION AT MADISON SQUARE GARDEN, NEW YORK CITY, TAKEN FROM THE "ELECTRICAL REVIEW" HEADQUARTERS.

Mr. Albert B. Herrick, the consulting engineer, has changed his offices from 150 Nassau street to 120 Liberty street, where he will be nearer his clients and have more space to accommodate his rapidly increasing business.

THE ELECTRICAL SHOW.

A GOOD START MADE—THE ATTENDANCE GRATIFYING—COMPLIMENTARY COMMENTS OF THE DAILY PAPERS — INTERESTING FEATURES ATTRACT ATTENTION.

With the ending of the first week of the Electrical Exhibition at Madison Square Garden, New York city, it is plain to be seen that things have settled down, the last evidences of crudeness have worn away and the little Electric City is proving a popular rendezvous for the great public that is waiting and willing to be instructively amused.

The electrical decorations on the Garden tower are striking and beautiful. They probably have a magnetic quality as well, if one may judge by the crowds which nightly are drawn across Madison Square with their eyes on the tower and their footsteps leading to the Garden entrance.

The daily newspapers in New York city have printed column after column describing the popular features of the exhibition, and their comments have been of a highly complimentary character.

The electric waterfall at the far end of the Garden is an interesting feature, and many questions have been asked as to why the water apparently runs up hill. The nightly blowing up of the little ship in the tank in the center of the hall, by means of a torpedo set off by wireless telegraphy, never fails to attract a large crowd and to occasion screeches of terror from the ladies.

On Monday evening of this week a stereopticon war bulletin service was inaugurated. The screen on which war news appears at frequent intervals is located in the gallery on the north side of the Garden. Several of the New York daily papers have kindly consented to supply the news bulletins by direct telephone to the Garden as fast as they come by telegraph to their offices.

The ELECTRICAL REVIEW presents on this page two interesting views of parts of the show. One view is taken from our headquarters in Newspaper Row over the main entrance to the Garden, and the other shows the electrical cascade at the far end of the building.

The meetings of the associations of stationary engineers began in the

(Continued on page 302.)

TRIMMING AND CLEANING OF ENCLOSED ARC LAMPS.

BY J. H. HALLBERG, E. E.

The trimming and cleaning of the inner globes of enclosed arc lamps are of the utmost importance, as the efficiency or candle-power depends, to a large extent, on the transparency of the inner globes. It is a very serious matter and well worthy of careful consideration. I will now suggest to my readers a system for doing this work, which will save many inner globes "kicks" from customers, carbons and labor; it may be applied to any size plant.

The following suggestions are based on the claims that one 12 by one-half-inch solid carbon will burn 125 to 150 hours, and applies to all enclosed arcs except the alternating, in which is used various sizes of carbons, some lamps using one solid and one cored, others two cored carbons, and there may be alternating-current lamps that use solid carbons in both top and bottom, but as yet they are not advertised in this country.

Let us suppose I am manager of a lighting plant, and a number of enclosed arcs have been put in service for either commercial or street lighting, and I was to get up a system of trimming and cleaning of these lamps. I would proceed as follows:

I would first make a box of tin or zinc about 18 inches long by 13 inches wide by 6 inches high and space it off so I would get room for 13 inner globes, 25 or more upper carbons, 25 or more lower carbons, 25 stubs of carbons left in upper holder after 125 to 150 hours' run, 25 stubs of burned-out lower carbons, and one space for a few small repair tools and rags for wiping.

I would cover the inside (bottom) with one-sixteenth-inch thick asbestos, which will prevent the chipping or breaking of the inner globes when they are placed in their spaces. I would attach a strong strap to this case for carrying same and get oil-cloth, or similar goods, to cover the globes and carbons in rainy weather, as dampness on carbons and inner globes has a bad effect on enclosed arc lamps. Then I would buy one extra inner globe for each lamp, as many carbons as I would need for one year and a few screws, etc., that are liable to get lost or damaged during burning or trimming.

When the time comes for the re-trimming of lamps I would place 12 clean inner globes in their respective spaces in the box, leaving the thirteenth space empty; 25 upper carbons, 25 lower carbons in their spaces, and a few of the small screws, etc., with tools and rags in their space; now all spaces but three in the box are filled. I put on a pair of gloves, pick up my box and ladder and start to trim.

First shut off current if lamp is burning or not, lower outer globe, take out dirty inner globe, place same in the thirteenth space in box, remove carbons left in upper and lower holder, and place them in their respective spaces; place new upper carbon in its holder (firmly) and try it up and down slowly to insure against binding; place new lower carbon in its holder, being sure no broken piece is left in bottom and that carbon is down as far as it should go; put on clean inner globe and lift clutch up so as to see everything works right.

Take a rag and wipe any part of lamp that may be dusty or dirty and reach down and wipe out the outer globe, as there is always more or less dust accumulated in it, either from the outside or from the arc enclosed in the inner globe; this latter is noticed more in the type of lamps that are designed to depend on the outer globe to check the inlet of air in order to get 150 hours' life.

You have probably noticed that in these lamps, if clear outer globe is used, after 100 or more hours, the globe gets a coat on the inside of a bluish film which gets denser the longer the lamp burns. This is probably a small thing, but if it is followed out it might prevent some "kicking" and dissatisfaction, and I am sure it will increase the candle-power from five to ten per cent.

Now I would set the outer globe in its support and wipe it on the outside and turn on the switch. In a properly designed lamp the trimming should not take over three to five minutes. After trimming 12 lamps I would get a fresh supply of inner globes and carbons, leaving the old ones in the station; this would be continued until all my lamps were trimmed.

Now I have a system of trimming that should work to perfection, with few minor changes to suit local conditions; and I also have a number of burned top and bottom carbons and dirty inner globes.

I will first rig up for cutting the carbon-pieces left in upper holders for next trim lower holder. I would make a simple gauge of some metal the exact length marked on tag of lamp, and cut my carbons with a hack-saw or a pair of shears, which I prefer, to this gauge, always taking care to get the size within one-sixteenth of an inch. This is of much importance. Next I throw away what is left of the lower carbons, as they are worthless.

My next move will be to clean the dirty inner globes. In looking them over I will find most of them are covered with a gray-white dust or film on the inside, which comes off if the globe is washed in clean water; but I will also find some that, after they are washed they show a brown-black stain around the top of the globe which, apparently, will not come off, no matter how much it is washed; in fact, it seems as if it was a natural color in the glass itself.

This is not the case; it is caused by several things. The most common are impure carbons, which contain too much metallic substances; by the lower carbon being too long, which in turn brings the arc too near the neck of inner globe; or it may be caused by too much current flowing across the arc, especially during the few minutes after trimming lamp with new carbons, which causes an excessive flame that gets in contact with the globe, and in that way stains it.

There is, to my knowledge, only one way to clean a globe in this condition, and that is, by dipping the burned part in hydrofluoric acid. This acid is very dangerous to handle, and much care should be exercised when it is used.

As this acid will eat through most every material except lead and wax, it must be kept in a jar of that material. I prefer lead, as the acid gets warm when it acts on the glass, and I have seen cases where the wax melted and let the acid run out.

I will now construct a round lead vessel about six inches high by three and one-half inches in diameter (inside). I would make this out of an ordinary lead pipe about three and one-half inches diameter; after cutting it off I would set it in clay or something similar, and pour melted lead in the bottom, so as to form a bottom side about one-half inch thick; be sure it melts together with the pipe and makes a good tight joint. You must not solder this bottom, as the acid will eat out the solder.

Now I will buy one pint of hydrofluoric acid, and put enough in this lead vessel so it will cover all but one-half inch of the inner globe when it is inserted. The hydrofluoric acid is put in special prepared wax bottles, and you must be careful when you handle them, especially in very warm places; if you get any acid on your hands it is well to wash them in water at once, and apply pulverized soda or something similar; it is well to have something of that kind on hand at all times.

I will select a place for this cleaning where I can get a draught to carry off the gas fumes and, if possible, have constantly running water. If running water can not be obtained, get two large tubs of clean water and, next, boxes spaced off for about 25 globes each, with perforated bottom.

After selecting the stained globes, I put on a pair of rubber gloves and commence work. First dip part of globe that is burned in acid (this will only take about one or two seconds in ordinary cases), then give it a liberal bath in the first tub of water; now we may find a light, white film on the globe, which we wipe off with a rag and then dip in the second tub of water. After this, place it in the box with the perforated bottom. After your box is full, take it to some warm place; say, on top of a radiator, steam-pipe, boiler, etc. After an hour you will find your globes are as good as new, but some may need a little cleaning with a rag.

Some people advise, in place of using the acid the way above described, to use 10 parts of water to one part of acid, and place your globes in this bath; this method takes at least 10 minutes, and, if several globes are in the bath at once, your chance of breakage is increased 50 per cent. My method is perfectly safe and very efficient, if you follow the above directions as near as possible.

Cincinnati Street-Car Conductors and Onions.

The Cincinnati Street Railway Company recently issued a remarkable order to the conductors in its employ, according to an exchange. Delegations of women called upon the officers of the company and represented that the conductors were indulging so freely and continuously in the savory Spring onion that traveling on the cars was almost unendurable. The officers hesitated to direct what their men should eat, but finally, to pacify the women, issued an order forbidding conductors to eat onions within 24 hours before going on duty. When a conductor wants to eat onions he will, under this arrangement, be obliged to take a day off.

WELLMAN'S MARINE TORPEDO.

BY H. PAGE WELLMAN.

In the use of marine torpedoes, while there is no difficulty in bringing the torpedo into close proximity to the vessel to be destroyed, it is often very difficult to bring it into intimate contact therewith. Generally, it is not desired to explode the torpedo until after the diver or operator placing same has retired to a safe distance, and heretofore it has not been possible to readily secure it to the metallic armored hull of a war vessel and, to a certainty, have it retain its original placed position until the diver is at a sufficient distance away so as not to be injured by the final explosion.

With this in view, the torpedo is provided with electro-magnets located near the forward end thereof, the purpose of which is to temporarily secure it to the metallic armored hull of a battle-ship or war vessel until such a time as the operator desires an explosion.

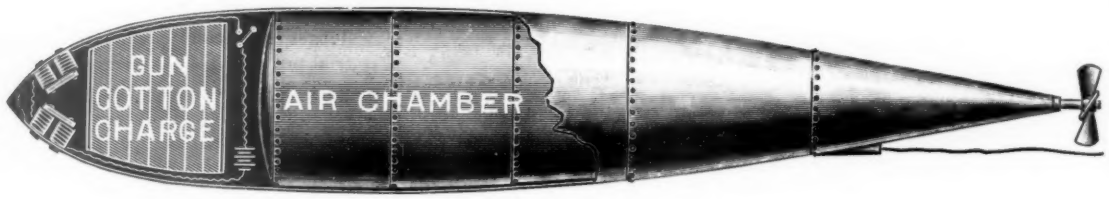
The coils of the magnets are energized by either a primary or storage battery located within the torpedo shell. A single-pole switch is included in the circuit, in series with the battery and magnet coils, which is closed by the operator before it is started on its errand of destruction. The closing of the switch terminals permits the electrical current to circulate through the magnet coils, which create powerful magnetic fields on the outside of the torpedo shell, the effect of which is to instantaneously secure the torpedo to the iron or steel hull of the vessel with which it has come into contact. It will then remain securely moored in immediate contact with the hull until the battery current is interrupted either through an outside agency or through explosion.

The core ends or poles of the magnets may extend entirely through the non-magnetic shell of the torpedo or abut immediately against the inside of same; also, they may be extended outside the hull of the torpedo, and to these ends may be secured magnetic metal plates which act as swivel pole-pieces, and which, when the torpedo is under way, cling closely to its sides and offer but little resistance to its passage through the water.

Upon coming in contact with the metallic hull of a war vessel, these swivel ends or plates open out and present a large magnetic contact area to the hull, thus more readily adapting themselves to the irregularities of the surfaces in immediate proximity.

Iron-linked plates or chains may also be secured to the exposed magnet core ends in place of the metal plates, care being taken that the chains are not long enough to extend between and connect the ends of the magnet cores, thus short-circuiting their magnet field and rendering their operation ineffectual.

The apparatus is especially valuable with torpedoes to be used in connection with submarine boats, as upon reaching the vicinity of the vessel to be destroyed, the diver emerges from within the submarine boat with the torpedo, and placing it in contact with the vessel's hull, he retires to a safe distance before exploding same.



WELLMAN'S MARINE TORPEDO.

One of Mr. Wellman's torpedoes is on exhibition at the electrical show now in progress at Madison Square Garden, New York city.

Electric Lighting in New Haven, Ct.

The ELECTRICAL REVIEW has received from Mr. Henry Hopkins, Superintendent of Street Lighting of New Haven, Ct., the "Report of the Committee on Lamps of the city of New Haven, Ct., 1897." The report is made to the Common Council of the city and includes a full account of the work of the committee during the year previous to the report. The following interesting statement is made:

It costs the city of New Haven on the average of $478 per mile to light its streets. The cost per capita is 64 cents. The per capita of New York city is 50 cents; Cleveland, Ohio, 64 cents; Baltimore, Md., 80 cents; Providence, R. I., $1.73; Cambridge, Mass., $1; Worcester, Mass., 88 cents; Washington, D. C., 57 cents, and Detroit, Mich., operating a municipal plant, $1.01.

Two Kinds of X Rays.

The latest discoveries regarding the Roentgen rays are reported to have been tested by Professor Valenta, of the Vienna State School of Photography. The fact that there are two distinct kinds of these rays, he states, is not generally known. One of them has the faculty of penetrating everything, even metal and bones. This kind is formed only when the glass tube is void of air. That is a condition very soon arrived at, and till the other day no means of preventing it was known. Now, however, glass tubes are made with a bulb fused to the top and filled with caustic potash and connected with an electric apparatus. As soon as the air in the tube is exhausted the current passes through the bulb, heats the caustic potash, which creates water steam, and this latter fills the glass tube with air. For this reason they are called self-regulating tubes. There is also a great success in the photographic application of these rays to chronicle. Now films made of celluloid are used as plates; they are coated on both sides, and the screen is prepared with a fine-grained mass. The result of all this is that the picture is more expressive, and that the time of exposure has been considerably reduced. An entire human figure can now be taken in two or three minutes, whereas formerly three to four hours were requisite.

OBITUARY.

Charles Atwater, of Pittsfield, Mass., and formerly treasurer of the Stanley Electric Manufacturing Company, of Pittsfield, Mass., died suddenly in London, England, on May 1. He had been in Europe since last Fall, and was on his way home at the time of his death.

Morris W. Hall, secretary of the Camden, N. J., & Suburban Railway, died on May 3, of Bright's disease, at his home in Merchantville. Mr. Hall had been the secretary of the company ever since the present management took charge of the affairs of the old Camden Horse Railroad Company. He was about 45 years old.

Sad Death of a Cuban Volunteer.

Narcisso J. B. De Luna, a Cuban patriot, who was in charge of 50 volunteers for the Cuban Army, was killed by a train at Savannah, Ga., on May 3, while en route to Tampa, Fla. Mr. De Luna was well known to the electrical fraternity in New York, where he had made his home during recent years, having been a refugee from Cuba.

For eight years past he had been in charge of the shipping department of the Safety Insulated Wire and Cable Company, of New York. On April 30 Mr. De Luna received leave from Mr. Leonard F. Requa, general manager of the company, to go to the front in the Cuban Army. Mr. Requa agreed to hold his position open for him until his return, and to turn over his salary to his family in New York during his absence. Mr. De Luna started for the South on Sunday night, and was killed at Savannah on Tuesday. The train had stopped at that place for breakfast, and Mr. De Luna was paying the bill for his command at the railroad restaurant. In trying to catch his train he was struck by a second train bound in the opposite direction, and was instantly killed.

On learning of his sad death, his associates in the Safety Insulated Wire and Cable Company promptly subscribed a handsome purse, which has been turned over to his widow.

German Use of Coke in Stationary Steam Plants.

Consul Bouchsein writes from Barmen, March 11, 1898: According to a report on smoke-consuming appliances of a royal Prussian commissioner, none of the systems give perfect smokeless combustion of coal. Coke is therefore extensively used in stationary steam plants where smoke is objectionable. Consumption in this line has increased rapidly in recent years, amounting to 7,900,000 tons in 1894 in Germany, an increase of 11.1 per cent over that for the preceding year.

Timely Remarks in a Philadelphia Street Car.

[*From the Philadelphia North American.*]

"Does this car go as far as One Minute street?" asked a passenger on a Market street trolley.

"Never heard of it," replied the conductor.

"Well, then, Sixty-second street," smiled the passenger.

And the conductor coughed and said: "That's hour terminus."

Electrical Review

[OLDEST ELECTRICAL WEEKLY IN THE UNITED STATES.]

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SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.
NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

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Mr. Russell Howland, of the ELECTRICAL REVIEW staff, a member of the Naval Reserve, has been ordered to report for service in Uncle Sam's Navy, and began duty upon board the "Yankee" last week. Mr. Howland will carry with him the best wishes of his co-workers on the REVIEW; his name will remain upon the salary list of this publishing company and his position awaits his return, which, it is to be hoped, will be soon.

DEWEY'S VICTORY.

Electrical men, as well as all other Americans, are full of enthusiasm and rejoicing over Admiral Dewey's great naval victory at Manila. The most marvelous feature, of what may prove to be the most remarkable sea fight of modern times, is that not a single American life was lost and that but six of our sailors were wounded.

Among the officers attached to Dewey's squadron was Lieut. Bradley Fiske, who is well known to the electrical fraternity as the inventor of the Fiske range-finder and for his electrical work in other directions. Lieutenant Fiske was on the "Petrel," and it was his ship to which the task was assigned of destroying the remnants of the Spanish fleet after the battle was over.

The ELECTRICAL REVIEW joins in the national congratulations to Admiral Dewey, his officers and his men on their splendid and typically American performance of their duty.

THE VOLUNTEER ELECTRICAL CORPS.

It is to be hoped that the volunteer electrical corps, which is being rapidly organized by Capt. Eugene Griffin, Dr. Louis Duncan, Lieut. F. J. Sprague, Lieut. O. T. Crosby, and others, will not be placed on the same footing as other volunteer corps recruited for other purposes. It is perfectly proper that regular army officers, preferably from the engineers, should command the volunteer electrical corps. But it certainly would be a mistake for a corps organized solely for emergency work to be kept in camp or drilled in the manual of arms until army ideas of perfection have been reached. Every man in the electrical volunteer corps knows his job and knows it thoroughly. His immediate superiors will be men in his own line of work, whose ability he recognizes. Let these officers and their men, under the command of a regular army officer, perform their special work in their own way, and the War Department will be astonished at their ability, rapidity and intelligence. The volunteer electrical corps does not and need not know military tactics—it must and does know how to handle a pair of pliers.

PRESIDENT McKINLEY ON ELECTRICITY.

We believe the timely and appropriate message sent by President McKinley to the Electrical Exhibition on its opening in Madison Square Garden, New York, worthy of the special recognition we give by publishing here. Mr. George C. Maynard, the Washington correspondent of the ELECTRICAL REVIEW, was the only newspaper man present at the White House at the time. President McKinley telegraphed the following:

"It gives me pleasure to open the Electrical Exhibition in Greater New York and to participate in this demonstration of the latest method of transmitting, recording and publishing by means of electricity. I congratulate you upon the achievements of American genius. I am glad to know that the resources of the wonderful electrical arts have already been so far advanced in the United States that American electrical goods are welcome the world over."

The allusion to the demand for our electrical goods the world over was particularly apt, as shiploads of electrical apparatus are now being completed for foreign markets. The managers of the Electrical Exhibition are to be congratulated over the distinction accorded their extensive and deserving display of electrical manufacture, and President McKinley in every sentence shows his understanding of the developments in this art and appreciation of the genius and labor that has brought it to its present important state.

The only apparent effect of the war on the electrical industry in the United States has been to set the majority of the manufacturing plants running day and night. The wire and cable companies are overburdened with orders, chiefly from the government. Makers of dynamos, motors, searchlights, ship-lighting sets and small supplies are also unusually busy. Many of these companies are working short-handed in their administrative forces, owing to the fact that a considerable number of their people have volunteered their services to the government in various capacities. The war will result in profit to the electrical industry, and the electrical fraternity has been and will be of invaluable assistance to the government.

The telephone is 22 years old. Its commercial age, calculating from the first exchange in New Haven, Ct., is 20 years.

WALL STREET AND THE ELECTRICAL STOCK MARKET.

The easy victory of our fleet at Manila followed by the increasing domestic difficulties of the Spanish Government, convinced the more timid or more conservative financial interests that the war must perforce be of short duration. The first result was a decidedly easier feeling in the money market and lower rates of interest which were promptly reflected in a substantial appreciation of security values. It may be said that the general public so far has been responsible for only a small portion of the activity witnessed on the Stock Exchange this week, the bulk of the operations having been carried on for the account of large interests. There is no denying, however, that a revival of interest in speculation is imminent, if, indeed, it has not already begun. Wall Street is now discounting peace. A cessation of hostilities, the ruling high price of wheat, evidences that commercial and industrial prosperity will attend this country this year, all combine to produce a more buoyant feeling.

General Electric opened at 32¼ and sold as high as 34¾, the price holding steady for the greater part of the week. Transactions in the stock were heavier than in a long time. The debenture 5's sold at 101. It is understood that at the annual meeting of the company next week a committee of the common stockholders will be appointed to arrange for the much talked of reduction of the capital stock of the company and will confer with the preferred stockholders.

Western Union, in common with the rest of the market, was strong and higher. Opening at 87, it advanced 3 points on moderate transactions. The collateral trust 5's sold at 106.

North American was spasmodically active and as usual fluctuated fractionally, opening at 5½ and selling up to 5¾. Edison Electric Illuminating of New York stock was quiet at 122; the 1st 5's changed hands at 109½. Edison of Brooklyn sold at 108¼. American Telegraph and Cable was very quiet, two sales being made at 90 and 91.

The number of telephones put in use by the American Bell Telephone Company for the month of April aggregated 29,264, an increase of 8,838 as compared with last year, and since December 20, 109,921, an increase of 32,186 as compared with a year ago. On June 22, the stockholders will

vote on the question of increasing the capital stock from $2,000,000 to $4,000,000.

At a meeting of the board of directors of the Michigan Telephone Company it was decided to discontinue the payment of dividends for the present, in order to hold the resources of the company to enable it to meet the unremunerative rates of speculative competition and, at the same time, to maintain and extend its plant. The volume of business of the company shows a continuous increase.

On the Boston Exchange this week Bell Telephone rose from 250 on Monday to 259½ on Friday on sales of only a little over 300 shares. Erie Telephone ranged between 65½ and 66½; New England Telephone sold at 126; Westinghouse common, from 20¼ to 22, and the preferred 50½ to 52.

In Philadelphia Electric Storage Battery common was bid 20, offered at 21½, and the preferred 22 @ 23½. Pennsylvania Heat, Light and Power on heavy transactions gained 6 points to 13 on Thursday, reacting fractionally at the close. RAY.

Wall Street, May 7.

LATE NEWS.

Miss Edith Jarnagin, who is 22 years of age, has been appointed chief train despatcher of the Chattanooga Southern Railroad, at Chattanooga, Tenn. This is the first time in the history of railroading in that state that a woman has held such a place. The young woman is said to be an experienced telegrapher and fully competent.

Two masked and armed men boarded a General Electric Railway car which was standing at Thirty-ninth and Morgan streets, Chicago, the end of the line, the other night, and, compelling the conductor and motorman to hold up their hands, robbed the conductor of $33 and his watch. This is the second robbery of the kind recently in that neighborhood.

An increase of the capital of the Stillwater & Mechanicsville Street Railway Company from $60,000 to $250,000 has been approved by the New York State Railroad Commission. The increase is to be used by the company in the construction of a new line to run from Mechanicsville to Waterford, where it is to connect with the Troy City Railway. This is taken to mean that it is only a question of time when an electric through line will extend from Troy and Albany to Saratoga Springs.

SCIENCE ABSTRACTS.

The following extracts of interest to our scientific readers are from the official publication of the Institution of Electrical Engineers, London, edited by Mr. J. Swinburne:

Heating Effects of Roentgen Rays. E. Dorn. (Annal. Phys. Chem. 63 pp. 160–176, 1897.)—That the X-rays exert a definite heating effect was already assumed by their discoverer. The effect may be definitely proved by exposing suitable metallic sheets to the radiation in a vessel communicating with a Toepler pressure gauge, which shows an increase of pressure due to the heating of the sheets and expansion of the gas. That this expansion is not due to dissociation may be proved by reference to the amount of electricity disengaged, according to which the fraction of dissociated air in the bulk of the gas is of the order 10^{-12}; i. e., quite inappreciable. Besides, the same increase of pressure may be brought about by the artificial heating of the same metallic sheets, which also enables the observer to accurately determine the amount of the heating effect. The author carried out a series of experiments on this principle, using platinum or palladium sheets mounted at intervals along a cylindrical vessel connected with the pressure gauge. With nine accumulators and a sparking distance of 83 millimetres, the heat radiated per second was 1.68 mgr.-calories, a very small value in connection with cathode rays. That the heat was not produced by induced currents in the sheets was proved by interposing a glass plate, which, by absorbing the X rays, reduced the heating to one-fourth of its value.

Rapid Exposures in Radiography. G. Séguy. (Comptes Rendus, 125. pp. 602, 1897.)—Coat a thin glass plate with bromide emulsion on both sides. Make two flexible screens of linen with Becquerel's violet sulphide of calcium suspended in celluloid. Put one of these screens on each side of the coated glass plate, and back both with black card. Put in a frame under pressure. This gives the thorax very clearly in 30 seconds, and other exposures may even be instantaneous.

Measurements by Alternating Currents. H. A. Rowland. (Amer. Journ. Sci., 4. pp. 429–448, 1897.)—The author describes a system of measuring capacities and inductions by an electro dynamometer in which the main current (being generally the larger) is led through the fixed coil, and the induced current, or the current through a condenser, is led through the moving coil. These currents then differ in phase, and the resistances in circuit are varied till the phase difference is 90 degrees, when the deflection is zero. On this principle the author gives six methods for comparing capacity and self-induction, and six for measurement with mutually inductive coils. He describes, further, 10 methods of comparing inductions and capacities, using a dynamometer in the ordinary way and balancing to zero current by varying the resistances. Two months also are given of determining capacity of self induction in terms of resistance and frequency, by comparison of the dynamometer deflections. The author has found from experiment that by some of these methods the self-inductions of two coils can be compared to within 1 in 10,000, and, as capacities, mutual and self-inductions can be compared one with another, he advocates standards of self-induction for the measurement of all these quantities. He discusses the construction of these and the errors to which they are subject. In measuring resistances by alternating currents, the author claims that accuracy is increased a thousandfold by passing a strong current through the fixed coil of the dynamometer and the testing current through the movable coil.

The Cable News from Manila.

At 4.22 A. M. Saturday, May 7, the New York *World* received the following cable dispatch, the first news from Manila since the cable was cut by Commodore Dewey on the Monday previous:

HONG KONG, MAY 7—Just arrived from Manila, "McCulloch." Entire Spanish fleet destroyed. Eleven ships. Spanish loss, 300 killed, 400 wounded. Our loss, none killed, six slightly wounded. Ships uninjured. Bulletin. HARDEN.

This message was received at the early hour named and was taken down by Mr. G. P. Blood, in charge at that hour of the New York office of the Anglo-American Cable Company. Realizing its importance, Mr. Blood immediately telephoned it to the *World*, and that paper promptly sent it to the President and Cabinet and to the Associated Press and Reuter's Telegram Bureau, and in a few brief moments the entire world had the news, after a period of nearly five days without a word from Manila. The message traveled over a distance of 15,000 miles, as follows:

	Miles.
Hong Kong to Labuan	1,220
To Singapore	733
To Penang	398
To Madras	1,388
To Bombay	800
To Aden	1,850
To Alexandria	1,603
To Malta	913
To Gibraltar	1,126
To Lisbon	337
To Penzance	856
To London	400
To Valentia	600
To Newfoundland	1,881
To New York	1,200
Total	15,315

The enterprising New York daily, the *World*, is to be congratulated over its success in being the first to get through a dispatch after all communication had been cut off.

PERSONAL.

Prof. Elihu Thomson and Lieut. Frank J. Sprague have accepted the invitation of the Northwestern Electrical Association, and will attend the June meeting on board the steamer from Chicago and at Duluth.

Dr. Louis Duncan, the well known electrical engineer of Baltimore, Md., has received his commission as Major of Volunteers in the United States Army, and will command a corps of engineers, chiefly composed of electrical men, which is now recruiting in Baltimore and vicinity.

Mr. Frederick Swift, well known in the railway and electric lighting field, has moved to Chicago, and will hereafter be associated with the Illinois Car and Equipment Company, of that city. Mr. Swift's many friends in the East will wish him all success in his new relations.

The enterprising general manager of the New York & New Jersey Telephone Company, Mr. W. D. Sargent, promptly ran a telephone line to Camp Black, Hempstead, L. I., and placed the 8,000 men and officers in camp there in communication with the outside world. This was patriotic enterprise. Mr. Sargent was one of the war telegraph operators on the Union side during the War of the Rebellion.

Messrs. Thos. R. Mercein and J. M. Hill, of the Northwestern Electrical Association, returned to Chicago this week after visiting New York city and Boston in the interest of the June convention of the association. They invited Mr. Edison and Mr. Tesla to be the guests of the association, and both these distinguished electricians are considering the possibility of accepting the courtesy. Mr. Edison is particularly interested in the methods of mining copper in the lake regions, and has promised to go if possible to get away.

Philadelphia's Volunteer Engineer Corps.

Capt. Eugene Griffin, first vice-president of the General Electric Company, has instructed manager E. W. Mullen, of the General Electric Company's Philadelphia office, to begin recruiting a special battalion of engineers, to comprise draughtsmen, artisans, electricians and skilled mechanics. A recruiting office has been opened at 509 Arch street. Seven hundred men will be required, and there are now over 500 applicants for enlistment. The men will be assigned by the War Department to mining and engineering operations in the harbors.

INSULATION AND CONDUCTION.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK, MARCH 23, 1898, BY REGINALD A. FESSENDEN.

(Continued from page 602)

This phenomenon of osmosis has been generally treated of as due to pressure, and the dissolved substance to exercise a pressure equal to that which it would have if turned into a gas at the same temperature and volume. The writer (in the *Electrical Review*, London, November 27, 1891) pointed out, as above, that the results were better explained by supposing that the solvent took up the cohesion of the solute, and that this got rid of the great difficulty of the disassociation theory, i. e., that solution was generally accompanied by heating. Recently, this theory has been put forward by other well known physicists. Professor Poynting (*Philadelphia Magazine*, October, 1896) has treated the subject mathematically, and whilst the mathematical reasoning can not be considered conclusive, as Professor Poynting himself states, yet, as he puts it, it shows "that it is not necessary to ascribe osmotic pressure to disassociation, but rather to association, or some kind of combination of salt and solvent." I have ventured therefore, in view of this fact, to do what I would not have done otherwise, i. e., to substitute my own conception of a suction for that of a pressure, otherwise making no change.

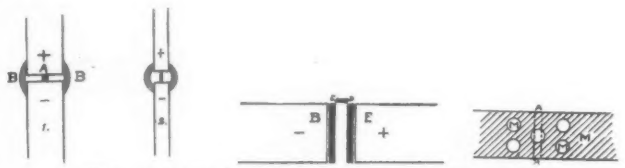
In this way, by measuring the osmotic suction, we can tell whether a salt is disassociated or not; and it is found that only those salts which are disassociated can conduct electricity. The molecules split up generally into two parts, one charged with positive the other with negative electricity. These charged parts or ions when placed in an electro-static field, move with a velocity proportional to the slope of potential and to the specific ability of each ion to move among the crowd of molecules of the solvent. Consequently, the faster an ion can get along through the crowd of other molecules, i. e., the faster it can diffuse the faster will the electricity be carried, and the greater the amount carried per second for a given slope of potential; also the greater the quantity of electricity carried per ion the greater the current. The total quantity carried will be the sum of that carried by each ion, so that by adding the velocities of the ions we get the total velocity with which the electricity is moving.

The conductivity of a solution is thus dependent upon the following:

1. How powerful the attraction of the molecules of the solvent is for the ions of the solute, for on this depends how much of the solute is disassociated, i. e., how many ions are set free to carry the current.
2. How fast the ions move.
3. What the valency of the ions is.

In designing insulations, the first is the important point. For from it we see that two good insulators mixed do not necessarily make a good insulator. A solid may dissolve in one substance and be an insulator in solution, but in another solvent may conduct quite well.

This is what makes the chief difference between fluid insulators, for practically all the fluids which are not simple elements, like mercury, have very high ohmic resistance, and all have practically about the same dielectric strength. The ohmic resistance of pure water is, according to Kohlrausch and Heydweiller, about one megohm per cubic centimetre, consequently on account of its non-inflammability and great specific heat, its great heat of vaporization and low boiling point, it would be a very valuable insulator for some types of apparatus were it not for the fact that it dissolves almost everything in slight proportions and splits them up into ions. Varnished paper will dissolve in some high-resistance oils, forming a conducting solution.



FIGS. 4, 5 AND 6.—"INSULATION AND CONDUCTION."

C. Conductivity in Gases—There is much evidence to show that conduction in gases is electrolytic, more especially J. J. Thomson's beautiful work on this subject. Also the fact that in air or CO_2 carbon is deposited on the negative pole, sometimes to the thickness of more than an inch in enclosed arc lamps, according to Marks, while in hydrogen or hydrocarbons in many instances the carbon is deposited on the positive carbon, would seem to favor this view. Also in its favor is Prof. Elihu Thomson's observation of the formation of copper "trees" in incandescent lamps with coppered filament joints. Against this is Schuster's observation that the metallic lines in the spectrum have a fairly high velocity, and also the general appearances of the arc, which looks as if something were going in one direction down its center and something else back on the outside. Also there is one other phenomenon which looks as if it were convective. This is the fact that, if we take a solid carbon and bring it nearer to a similar carbon while the current is passing, the resistance first decreases and then increases. This was, I believe, first pointed out by Mrs. Ayrton in her admirable paper on the subject. The reason of it has not, I believe, been given; it seems to be due to a necessity for circulation in the arc. If we have two carbons, as in Fig. 4, at 1, the center part of the current seems to flow all right, but the part B can not flow unless the + carbon is very hot, and this is only cured by either increasing the current so as to heat the whole carbon up or by reducing the cross-section, as at 2 in Fig. 4. Whether a carbon is cored or not has nothing to do with this increase of resistance on the distance being shortened, as all that coring does is to diminish the cross-section of the carbon, and I have repeatedly found by actual test that the difficulty is entirely obviated by using carbons of × or — cross-section, provided the greatest thickness at any point of the cross-section is less than that of the cored. The phenomenon is evidently analogous to the jumping back of the discharge in a Geissler tube when the electrodes are brought too close together. The theory of this was given by J. J. Thomson, and it was by applying this that I got over the difficulty with the carbons. A true arc can be run from a much lower voltage in open air than is generally supposed when the section of the carbon at any point is not more than $\frac{1}{100}$ centimetre thick. On the whole, the evidence seems to be in favor of the belief that both convective and electrolytic discharges take place in air. The whole subject is very fully treated in J. J. Thomson's "Recent Researches in Electricity and Magnetism." There can be, in my opinion, very little doubt but that, when a true electrolytic discharge takes place, as it does in a hot flame, the conductivity is proportional to the velocity of sound in the gas, though so far I am not aware that any experiments have been made on the subject. Is it possible that in certain cases the elasticity itself may be a function of the slope in the electrostatic field? As the vacuum increases up to a certain point, the dielectric strength decreases, and this point depends somewhat on the electrodes and voltages, and has led to the amusing result that, on the average, every two years the discovery is announced that a vacuum is a good conductor. Above this the discharge appears to get more and more convective, and a fact may be stated which I have not seen mentioned, i. e., that the largest quantity of X rays is not got from a tube unless the path of the positive particles back to the cathode is blocked up as much as possible. An experimental tube, made by Mr. Meadowcroft for the writer last Spring, in which there is a small tube running from the back of the anode to the back of the cathode, which can be blocked up by tilting it, shows this very nicely.

As regards the electrolytic discharge, this can only take place when the gas is disassociated by heat or by a strong slope of potential. To the convective discharge the same remarks apply as to the convective discharge in gases. At ordinary pressures, the only gases which allow a discharge to pass easily are helium, argon, and, possibly, that unknown gas whose spectrum we see in the light of the Aurora Borealis. Helium, as shown by Ramsey, behaves at ordinary pressure much as air at low pressure, and a spark will jump through it for about 30 times the distance it will through air at the same pressure, when the pressure of both approximates that of the atmosphere.

Having got rid of the theory which was necessary in order to give opportunity to condense later, and which has led me to wonder if it were ever possible to find the pleasing mean between the conciseness of the Carpenter and the discursiveness of the Walrus, we shall take up the practical part of the subject.

HIGH-RESISTANCE INSULATION.

In laboratory apparatus in many cases, for instance with electrometers and resistance boxes, we need as high ohmic resistance as it is possible to get. Here, however, we are met by the fact that the two substances most commonly used, i. e., hard rubber and glass, are among the poorest insulators known for this class of work.

Rubber is very objectionable from the fact that whilst it presents a nice bright appearance when new, it contains sulphur and is very easily oxidized, especially when exposed to light. A film of sulphuric acid is thus formed on the surface, and if the tongue be applied to a piece of rubber, which has been in use for some time, the taste of the acid is very strong. I have seen the top of a Wheatstone bridge, supposed to be capable of measuring accurately to one part in 5,000, in which the total length exposed to leakage, divided by the average distance between which leakage could take place and the average voltage was only .008, with the top so acid that the tongue could hardly be allowed to touch it.

As a rule it is very hard to remedy this; rubbing the surface does no good as the acid extends in to some distance. Rubbing with cigar ashes is advocated by some, but I should fancy it would be almost impossible to remove the last traces of alkali. The method used by the writer is to steep the rubber in warm 10 per cent caustic soda, then in warm distilled water, frequently renewed, then drying in the dark quickly and rubbing with pure paraffin, treated as described under paraffin, then polished while warm. This does good for a time, until the paraffin takes up dust.

For rods, a good way is to treat as above and coat half an inch thick with paraffin; then run over the rod with a wooden die and cut a thread in the paraffin. Run over the thread about once a month, and good results will be obtained.

With bridges, however, it is impossible to remove the top, and the only thing which can be done is to keep them covered up from light.

Rubber has also one other disad-

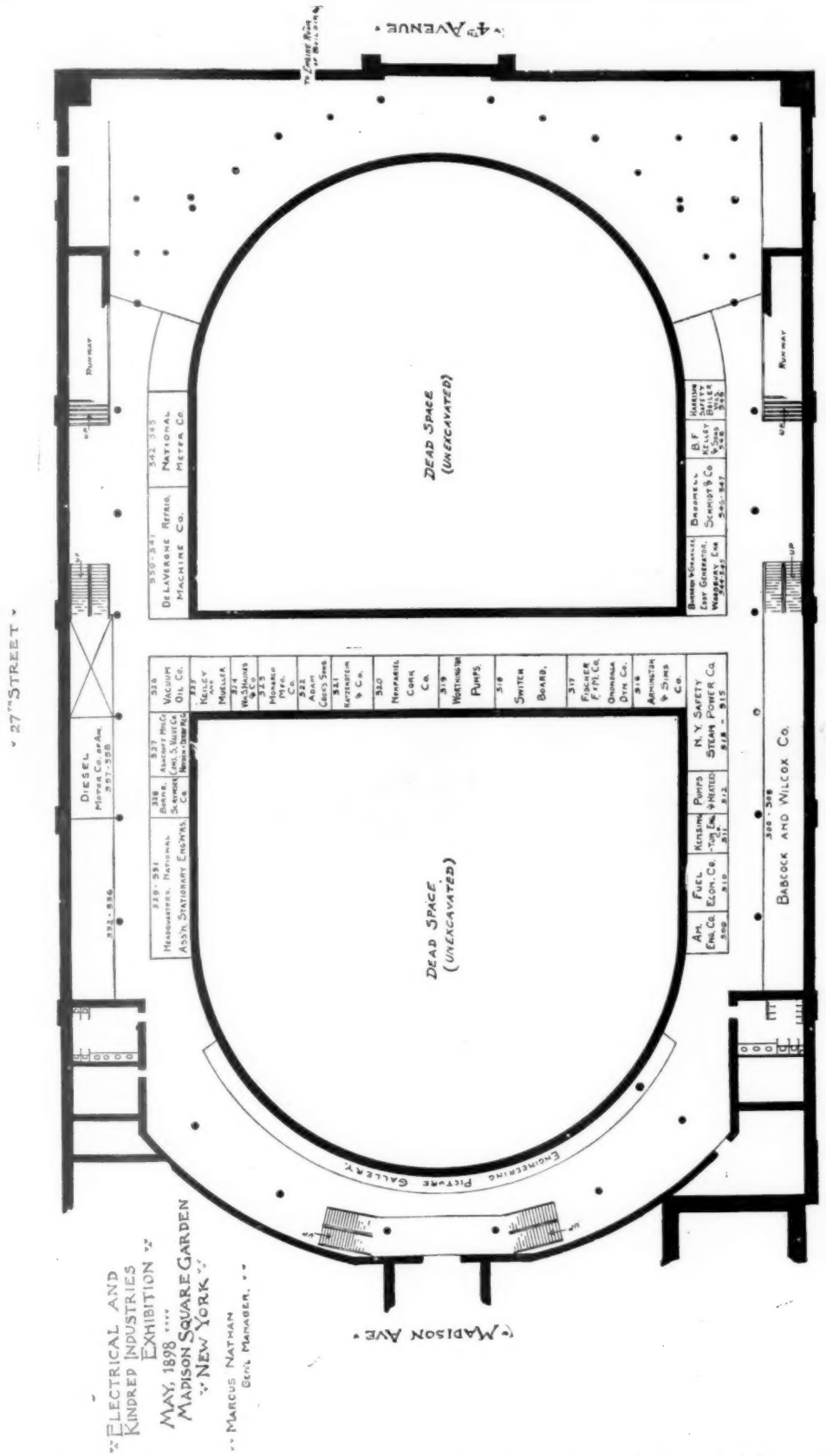


DIAGRAM SHOWING LOCATION OF OPERATIVE EXHIBITS AT THE ELECTRICAL SHOW, MADISON SQUARE GARDEN, NEW YORK CITY.

vantage, in that it does not show dirt, and where rubber comes in contact with copper it is apt to rot.

Glass is very bad because the alkali in it has a great affinity for moisture. The alkali is slightly soluble, and hence it is the custom with analytical chemists to boil all beakers used in exact work for several days before using, so as to get the soluble alkali and silica out of them. When possible, this should be done with the glass of electrical apparatus. Another very serious trouble is that the angle of contact between water and glass is zero, so that when a drop of water is placed in the middle of a pane of clean glass it immediately spreads all over it in a thin film. This method is used by chemists to determine when a glass is clean. Nothing much can be done with glass but to keep it dry. Sulphuric acid is generally used, but it sometimes, if allowed to get dust in it, gives off vapors which condense on the sides of the apparatus. This, however, does not often happen.

Evidently we need some substance of high ohmic resistance, and one which water will not wet. Boys, who has earned the thanks of electricians for his happy discovery of an almost perfectly elastic fiber, has given us, also, as he himself has pointed out, such an insulator in quartz. Dip a thread of glass in water and lay it between the knob of a charged electrometer and the ground, and the leaves close almost at once, the whole fiber being covered with a film of water. Treat a quartz fiber similarly and the water slides off it, or remains in little drops, each separate from its fellow, and the insulator is apparently as good as the air itself.

Quartz should therefore be used as much as possible in electrical instrument work. It can be melted in a powerful gas flame furnace, and though it can never be melted down free from small bubbles, these make no difference except in appearance. It is, however, possible to obtain glass which contains no alkali, and resembles quartz in that it is not wet by water. Such a substance is Faraday's borate of lead glass, as he himself points out. This is, however, too brittle for most work, but by an admixture with silica a glass could no doubt be made which would be perfectly satisfactory. If some glass manufacturers would take up this question and furnish us such a material for electrical instruments, the greater part of the present annoyance met with in making delicate experiments would vanish. It would not leak, would show dirt, could be readily cleaned, and would be free from one of the great disadvantages of rubber; i. e., a large co-efficient of expansion, which is always making trouble by bending terminals of resistance coils, thus changing their value and sometimes opening the circuit.

It is also probable that a fine grade of porcelain would be a great benefit to the electrical profession if coated with a good non-alkaline glaze.

(To be continued.)

American Stoker Company's New York Offices.

Last week the American Stoker Company, formerly located in the Garfield Building, Brooklyn, N. Y., took offices in the Washington Life Building, Broadway and Liberty street, New York city. The "American" stoker, of which the American Stoker Company are the manufacturers, is on exhibition at the electrical show, and visitors are cordially invited to call at the company's booth and investigate its working.

THE ELECTRICAL SHOW.

(Continued from page 295.)

Concert Hall last Saturday night, and will occur at intervals during the show.

EXHIBITION NOTES.

The Berlin Iron Bridge Company, of East Berlin, Ct., have in Section L, on the main floor, a steel building showing the construction of their patent anti-condensation corrugated iron roof covering, which is absolutely fireproof and is guaranteed not to drip or condense moisture on the under side. Many visitors call and see it.

The following are some of the people prominent in the electrical field who visited New York during the past week to witness the opening of the Electrical Exposition:

Mr. Salem Hardy, inventor of the well known "Hardy" incandescent lamp, made by the K. & W. Company, of Pittsfield, Mass.; Mr. James Stowell Anthony, manager of the press and publishing department of the Walker Company, Cleveland, Ohio; President S. Insull, Vice-president A. M. Young, National Electric Light Association; Geo. Redman; F. S. Gorton, Chicago; Morris W. Mead, Pittsburgh; F. C. Mason, Brooklyn.

The telephone service at the Electrical Exposition, Madison Square Garden, is one of the features of the event, and is greatly appreciated. The public evinces great interest in the working of the exchange system as shown there.

The vacuum tube lighting exhibit, as shown by Mr. D. McFarlan Moore, is located over the Madison avenue entrance to the Garden, and is seen daily by many of the visitors to the show.

R. Thomas & Sons Company, of East Liverpool, Ohio, show a line of the high potential insulators made in their factory and by way of a practical demonstration send a current around them which the experimenter said amounts to 60,000 volts.

The interest in the new thermostatic electric cables which have been introduced by the Montauk Multiphase Cable Company, of New York, has made this company's exhibit one of the features of the exposition. The cable, when used in interior wiring, is in itself an automatic fire alarm system and is one of the developments in the electrical field of the past year which has attracted much attention.

The Crocker-Wheeler Electric Company have a large exhibit centrally located in the center of the main floor. A detailed description of this exhibit will be published next week.

H. B. Coho & Company, New York, also have a main floor space showing an interesting series of the standard "Eddy" dyamos and motors, the Warren alternator and the "Crown" woven-wire brushes made by the company of that name at Salem, Mass.

The Excelsior Electric Company, of New York, are also one of the largest exhibitors of heavy electric machinery, showing a line of the "Churchward" dynamos and motors.

A repair "ambulance" for quick service in electrical repair work shown by the Electrical Maintenance Company, of New York, is one of the unique features.

Among the wire exhibitors the Samson Cordage Works, of Boston, show the product of their mills in arc lamps, signal and trolley cords.

Much of the machinery which the Walker Company shipped from Cleveland and New Haven has been delayed en route and consequently the exhibit of this company is not yet in readiness, though it promises to be one of the most comprehensive prepared.

An artistic booth filled with electric novelties in the way of pots of artificial plants, with tiny lights hidden in the flowers, attract a constantly changing group of feminine admirers. This exhibit is made by the American Electric Novelty Manufacturing Company, 231 Broadway, New York.

The Peckham Truck and Motor Company have several working models showing the construction and operation of the standard forms of the "Peckham" electric street car trucks.

The Electric Vehicle Company have a complete electric cab on exhibition and are also maintaining, convenient to the exposition building, an electric cab service for public use. These carriages use "chloride" storage batteries.

The New York Car Wheel Works have a line of heavy car wheels of different patterns on the main floor.

One of the most attractive and complete exhibits is that of F. A. LaRoche & Company and the Ideal Electric Corporation consolidated. The firm show their modern switchboard, which is built for one of the large drygoods establishments in New York city. This board is of exceptional beauty. On it is mounted the well known "Ideal" circuit-breaker and the LaRoche self-locking switches, with Weston instruments and all other switchboard features. They present also a switchboard containing ten "Ideal" circuit-breakers. Their booth is handsomely decorated, and is lighted by the LaRoche alternating and direct-current arc lamps. This firm also manufactures the LaRoche alternating-current dynamos, of which they show a complete line of machines, ranging from 1½ to 150 kilowatts. They also display quick break-switches, as well as ordinary knife-blade switches, which are made up of pure hard-drawn copper, guaranteed free from all impurities, and no castings are used in their construction. The main panel switchboard for the entire exhibition was manufactured and installed by F. A. LaRoche & Company; the board was delivered in four days from receipt of order, greatly pleasing the Electrical Exhibition Company's managers.

The K. & W. Electric Company, of Pittsfield, Mass., have an artistically prepared booth near the Fourth avenue side on the main floor, with an interesting showing of the "Hardy" incandescent lamps, dynamo brushes, spark arresters, cut-outs. This "Hardy" lamp is of interest to students of electric light matters, as the lamp is the development of Mr. Salem S. Hardy, who has for some years made a study of the incandescent lamp with the idea of a radical improvement which should mean a greater sustained candle-power. Mr. Salem S. Hardy and Mr. Charles Houliston, manager of the company's New York office, have been in attendance.

The Faries Manufacturing Company, Decatur, Ill., have an exhibit of the "Universal" electric lamp holders, lamp shades, boiler cleaners and a line of the specialties made in their factory. Their interests are represented by Mr. A. W. Koenig, the manager of the New York office.

The Baylis Company, New York, are now preparing an operating exhibit of a 30-horse-power double cylinder Nash gas engine of the vertical type. This installation will be used to supply part of the current for lighting the building. In addition, a number of smaller engines will be on view to show the different styles of the Nash engine. This exhibition is being made jointly by the National Meter Company and the Baylis Company.

The Manhattan Electric Storage Battery Company, New York, show a unique novelty in the way of a miniature Statue of Liberty, with a clock in the base and a small incandescent lamp held in the hand of the figure, which is supplied with current from a small "chloride" storage battery.

The Pope Manufacturing Company are showing several types of the new Columbia motor carriages and vehicles. They are made with the same care that has stamped the Columbia bicycle with its reputation, and are of great interest as showing the splendid progress which has been made in the construction of electric conveyances.

The Fuel Economizer Company, Matteawan, N. Y., has set up ready for operation one 150-horse-power fuel economizer.

The Nowotny Electric Company, Cincinnati, are showing a new arc lamp and also several of the styles it has been making for some time.

Mr. W. J. Clarke, general manager of the United States Electrical Supply Company, of New York city, gave an exhibition of the Marconi system of wireless telegraphy last Friday afternoon.

The Silex Insulating Company, New York, are showing a new form of conduit consisting of an outer steel and an inner brass tube, between which is packed the "Silex" insulation, kept in position by plugs of mica. The Silex material is impervious to moisture and is said to be a wonderful insulator, as its dielectric strength is such that it withstands the highest voltages, and is also a poor conductor. The con-

(Continued on page 310.)

FIG. 1.—CHASE CEILING OUTLET BOX.

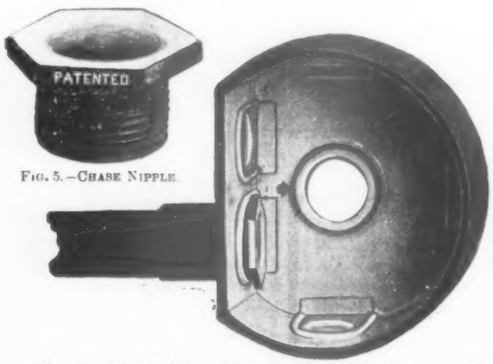


FIG. 5.—CHASE NIPPLE.

FIG. 2.—CHASE WALL BOX FOR TWO CONDUITS.

FIG. 3.—CHASE WALL BOX WITH RECESS.

FIG. 4.—CHASE CEILING BOX FOR TERRA-COTTA WORK.

The "Knockout" Outlet and Junction Box.

L. A. Chase & Company, of Boston, Mass., are placing on the market a metallic outlet and junction box, which they have christened the "Knockout." The box is made of a special grade of iron, and is heavily coated with a hard black enamel having high insulating qualities. A novel feature of the box is that it is so constructed as to have at frequent intervals on its surface thin webs or films, which a slight blow of the hammer will "knock out," leaving round holes for outlets in as many combinations as are usually required. The method of attaching the box to the conduit is also new. A hollow bushing or nipple, which is threaded on the exterior and smooth and insulated with enamel on the interior, is passed through the hole made in the box at the point desired, and screwed into the coupling on the end of the conduit. This makes a perfect mechanical connection, which can be made watertight. By means of this nipple, wires can be readily pulled through the tube into the box without any danger of abrasion or injury to the insulation of the wires.

This box can be disconnected instantly from the conduit by unscrewing the nipples from the inside of the box, thus allowing the box to be withdrawn regardless of the number of conduits that enter it.

Fig. 1 (opposite) shows a ceiling outlet box made by L. A. Chase & Company. This may be used for the outlets where the conduits enter from the side or back of the box. The hole in the center allows for a support for the fixture, or if used in combination fixtures the hole allows the gas pipe nipple to come through. Fig. 2 shows a wall box for use where two conduits enter, both on the same side. Fig. 3 is a box practically the same style as that shown in Fig. 2, except that it has a recess in the bottom which will enable it to straddle the tee of the gas pipe at the outlet. Fig. 4 shows a ceiling box for use on terra cotta work where all the outlets enter through the back. Fig. 5 illustrates a Chase nipple which is constructed from a special grade of tough metal and is made with a hexagonal head which allows the nipple to be easily screwed in the coupling on the end of the conduit. The nipple is thoroughly covered with a special hard enamel that will not chip off.

FIG. 1.—WESTINGHOUSE ENCLOSED ARC LAMP.

FIG. 2.—OUTDOOR TYPE OF WESTINGHOUSE ENCLOSED ARC LAMP, SHOWING GLOBE LOWERED.

Westinghouse Enclosed Arc Lamps.

The Westinghouse Electric and Manufacturing Company has produced a type of enclosed arc lamp for both direct and alternating-current, which conforms so closely to the recognized conditions of a perfect lamp that, apparently, nothing is left to be desired. These conditions may be briefly stated, as follows: Efficiency; long life; facility of adjusting, installing and trimming; small expense for carbons; steadiness and uniform distribution of light; adaptability to variations in frequency and voltage; freedom from noise, simplicity of mechanism; free ventilation; protection against weather; suitable location of switch; graceful and convenient form and dimensions.

Westinghouse arc lamps meeting these conditions are manufactured for use on constant-potential circuits. The alternating lamps possess all the advantages of the well known long-burning type for use on direct-current circuits. They are said to have none of the disadvantages inherent in alternating lamps of the open arc form, as they are noiseless, giving a uniform, steady, brilliant and evenly diffused light.

The Westinghouse direct-current lamps are made to operate singly on 110-volt circuits, or two to five in series across 220 and 500-volt circuits.

FIG. 3.—MECHANISM OF WESTINGHOUSE DIRECT-CURRENT ENCLOSED ARC LAMP.

They are adjusted to burn at either 3 or 4.5 amperes, and their life, with one trimming, is from 100 to 150 hours.

The mechanism consists of a double magnet, connected directly to an extremely simple clutch, which grips the upper carbon. The outer globe is held in place by a very simple automatic locking device. The movement is well ventilated and protected from the heat of the arc—a very important requisite in arc-lamp service.

For indoor work ornamented housings are employed. For outdoor use a plain black enameled housing is provided, and the lamps may be hung without a protecting hood.

The alternating-current lamp has a life of from 100 to 125 hours, and is of high efficiency, consuming about 450 true watts at six amperes, and giving 2,000 nominal candle-power. The loss in the choke coil on a 110-volt circuit with a current of six amperes is said to be about 25 watts.

The economy or choke coil, which forms a part of the lamp, reduces the line potential to that required by the arc, about 70 volts. This coil is provided with several loops, so that by proper selection the lamp may be connected to lines varying in potential from 95 to 120 volts, or may be adjusted for circuits of from 7,200 to 16,000 alternations.

The lamps give a steady and evenly diffused light. The mechanism is exceedingly simple, there being no carbon rods, chains or gear-wheels. The length of the lamp is two feet, six inches; the weight, including globe, 33 pounds.

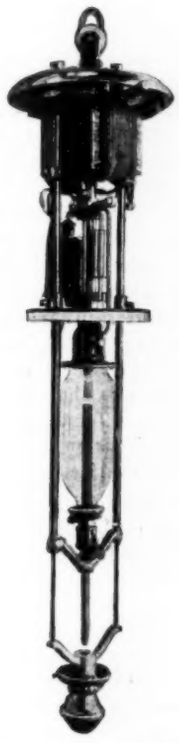


FIG. 4.—MECHANISM OF WESTINGHOUSE ALTERNATING-CURRENT ENCLOSED ARC LAMP.

The carbons are so proportioned that the stub remaining in the upper holder may be used in the lower holder for the next trim; consequently it is necessary only to use one 12-inch carbon each time the lamp is trimmed. The cost of carbons becomes insignificant because of their long life. One solid and one cored carbon is used in the lamp, and they should be of the best quality obtainable. The new Westinghouse lamps have proved to be so successful that the department of the Pittsburgh works where they are manufactured is about to be enlarged in order to supply the demand.

The Chicago South Side Elevated Road.

On Saturday April 30, the South Side Elevated Railroad, Chicago, a steam line operating 16 miles of track, placed in operation the Sprague multiple-unit system of electric traction. The road as it is now running has in operation a large number of trains so equipped, running mixed in with its own steam trains on the regular line and on the "loop." The change from steam to electricity is going on rapidly, and the whole road will soon be operated by the Sprague system. The multiple-unit system differs from others, in that the locomotive idea is abandoned. Each car is equipped with motors and what is called the multiple-unit control, and cars are combined in trains of any required length and are run from either selected end of any car. The change from steam to the Sprague system will be completely made within a few weeks. It is the intention of the road to run at shorter intervals with the new system, and to vary train lengths from one to five cars, according to traffic demands. Careful estimates made indicate to the managers of the road that they may save not less than $150,000 per year in operating expenses, independent of any increase in passenger traffic, which may be reasonably expected on account of improved service.

This system is the one which was recently adopted for the initial equipment of the Brooklyn Elevated Railroad, which contract was made by President Uhlmann and Chief Engineer Cornell, as a result of their study and inspection of the South Side equipment. It is thought by the advocates of this system, and by many engineers who have made a study of it, that the Sprague system of multiple-unit control marks the abandonment of the locomotive for elevated and suburban services now operated by steam.

Mr. Sprague, as is generally known, was a pioneer of the overhead trolley system, and installed the first road in this country at Richmond, Va., a good many years ago. He has made a study of electricity for rapid transit purposes, and the two contracts recently secured for his system by the Sprague Electric Company show that he has never lost his position as a leader in the development of electricity for purposes of rapid transit.

GUYON, QUE.—An agitation is on foot for better fire protection.

The Functions of a Lightning Arrester.

From now until the end of Summer the central station man has the usual number of thunder-storms and consequent damage from lightning to contend with. While there is a large number of lightning arresters on the market, very few seem to be constructed in accordance with established laws regarding the functions of this safety device.

Overhead circuits during storms become highly charged with an induced static electricity, the difference of potential existing in some instances between the line and the earth, in others between the different sides of the circuit.

Owing to its highly oscillatory character, this static electricity abhors a coil. It is due to this fact that, when the discharge seeks a path to earth through the coils of a dynamo, motor or other apparatus, it punctures the insulation of same, and takes the path to earth of least resistance, which is generally through the layers of an armature to the core, or over the air space to the pole pieces; the normal current of the line, following the lower resistance thus established, causes a "ground" or short-circuit, and a consequent burn-out.

It is the function of a lightning arrester to offer the discharge a better or lower resistance path to the earth.

Experience shows that static discharges will go over the infinitely high ohmic resistance of an air gap rather than through a few turns of a coil of but a few feet in length.

In the Garton arrester the discharge passes through the straight graphite shunt, which is in multiple with the coil, directly to the earth, with a small air gap in series. The armature, which is also in the path of the discharge and in series with the air gap, instantly interrupts the flow of normal current, and re-establishes the normal dielectric of the air gap.

A new sensation in the receivership proceedings of the Terre Haute Street Railway has been created by a circular letter of invitation for a meeting of creditors. The letter is signed by the First National Bank, Stanley Electric Manufacturing Company, Western Electric Company, American Electrical Works, Illinois Steel Company and John A. Roebling's Sons Company. It recites that the affairs of the company are much involved and there is need of an investigation. It is also said that bonds put up as collateral have been sold for nearly nothing, thus unduly swelling the liabilities, which were shown to be about $1,200,000 when the receiver was appointed. It is remarked in the circular that the real indebtedness may be less than $700,000, but that it may be considerably increased by the sale at low prices of $252,000 in bonds held as collateral for $160,000.

ELECTRIC RAILWAY NOTES.

The Syracuse, Skaneateles & Moravia, N. Y., Electric Railroad, with a capital of $1,000,000, has been incorporated with the Secretary of State at Albany.

The First National Bank, of Worcester, Mass., has commenced an action against the Zanesville Railway and Electric Company for $12,500, due on a note.

At a meeting of the newly elected board of directors of the Crescent City, La., Railroad Company the following officers were re-elected: J. C. Denis, president; R. M. Ford, secretary, and C. D. Wyman, general manager.

The street railway line of Georgetown, Ky., which some weeks ago passed into the hands of a receiver, has been sold at public auction, and was purchased by Mr. C. H. Williamson, the former superintendent of the road, for $29,000.

The Newburgh, N. Y., Electric Railway Company's net earnings for the quarter ending March 31 were $3,807.18, as against $3,292.01 for the corresponding quarter last year. The net deficit for similar periods was $5,157.82 and $5,263.08.

The village attorney of Tonawanda, N. Y., is about to begin an action in the Supreme Court against the Buffalo, Tonawanda & Niagara Falls Electric Railroad, to annul the franchise granted to that road, as a result of the alleged failure on the part of the company to pay its taxes, amounting to over $4,000.

The newly elected directors of the Market Street Railway Company, of San Francisco, Cal., have organized by electing the following officers for the ensuing year: President, H. E. Huntington; first vice-president, Charles G. Holbrook; second vice-president, Alvinza Hayward; treasurer, N. T. Smith; secretary, J. L. Willcutt. All of the officers named served in the same capacity last year.

All the street railway lines to West End, Crafton, Carnegie, Neville Island and Coraopolis, Pa., are to be organized under the name of the West End Traction Company. A mortgage for $1,500,000, made by the West End Traction Company to the Union Trust Company, has been recorded. A line will be built to Banksville, the Neville Island line will be double tracked, a number of extensions will be made, and improvements to rolling stock and roadway are to be made, costing in all about $500,000.

Electric Railway Extension in Dublin, Ireland.

Consul Ashby, writing from Dublin, Ireland, to the State Department, under date of March 18, says:

The substitution of electricity for horse traction upon the tramways in the city of Dublin is being pushed with great vigor by the Dublin United Tramways Company, and new lines and extensions of the old system are being planned. The Clontarf line is now operated by electricity, and arrangements have been completed for bringing the electric cars on this line to Nelson's Pillar, the tram center of the city. The work of substituting electricity for horses on the line from Haddington road to Nelson's Pillar, by way of Westland Row and Great Brunswick street, is being rapidly executed. This will connect the electric line from Dalkey to Haddington road with the tram center of the city, and will give an electric tram service from Dalkey to Dollymount, a distance of about 14 miles. The next two months will probably witness the completion of this work, as well as that of the electric line through Pembroke Township. In addition, the Dublin United Tramways Company has lodged a memorial with the lord lieutenant for an order in council authorizing the extension and doubling of the lines of its system in various districts of the city. These extensions and improvements are estimated to cost £74,000 ($360,121).

CANADIAN NOTES.

TAMESFORD, ONT.—Electric light is being agitated.

CAMPBELLTON, N. B.—The ratepayers have voted in favor of electric light.

STANBRIDGE, EAST QUE.—M. S. Cornell will install an electric light plant this spring.

WALLACEBURG, ONT.—The Wallaceburg Electric Light Company contemplate putting in an incandescent plant, having agreed to do so within eight months.

The new telephone franchise asked for in Indianapolis caused some embarrassment to Secretary Gates. The Mayor desired an explanation for the board of "the difference between an ohm and an ampere, and the relation of a volt to a watt." All waited the secretary's answer, but he confessed embarrassment and explained that he was not an electrician.

Our Congressmen and Their Electric Lights and Fans.

Congress had been very "conservative" as to the installation of electric lighting in both the House and Senate wings of the Capitol. In this, as in all things, except a war fund, they have been slow and deliberate.

Some years ago it was suggested that some of those little electric "bulbs" be put in the larger and more important committee rooms, but from where the current for the operation of these "bulbs" was to come was far distant from their thoughts, until estimates, etc., for a small trial plant had been submitted to the Committee on Appropriations some time later.

The price, high at that time, was surprising to them. However, the desire for "bulbs" grew, and a year or so later trial plants were bargained for. Westinghouse people were then successful, as they have been at the capital ever since.

Senatorial prerogatives to some of the older senators precluded all possibility of installing electric lights in their rooms, gas illumination of their predecessors being good enough for them; and, as Senator Sawyer, the millionaire lumberman of Wisconsin, said: "When I was a young man at my early home in Wisconsin I read my books and papers by the light of pine knots, and they are even now good enough for me."

But notwithstanding this fact his handsome residence on Connecticut avenue in Washington is at night brilliantly illuminated by the latest and most up-to-date electric appurtenances. In fact, this exquisite electric illumination in private residences in Washington is quite a fad among the elite of that city, and this has a great deal to do with senatorial lighting.

After the larger and more important rooms were lighted by means of electricity and were seen by the chairmen of the smaller committees, the desire increased, and it spread, and grew and became very contagious, until now every nook and corner of the great building of the Capitol is illuminated by incandescent lamps.

Incandescent arc lamps are also used to a large extent, and over the skylights of the Senate Chamber a number of them were installed. The first evening session thereafter, when they were lighted, caused so much interest and comment among Senators as to almost interfere with legislation. Senator Coke, of Texas, was particularly interested, and after gazing at the picturesque glass ceiling of the chamber for half an hour or more, finally beckoned for the deputy sergeant-at-arms, and in a most secretive stage whisper was overheard to ask: "I thought all those cracked glasses up there had been replaced by good ones. I see a dozen or more broken ones." "Oh, that is all right, Senator," replied the deputy, "those are not cracks, they are shadows from the wires for the new electric lights." "That is it, hey; well, ain't the lights turned on a little high? That is too much light." And for this and other objections the incandescent arc lights were removed and small incandescent lamps installed.

Then at the beginning of the warm season fans were inaugurated. In the cloak-rooms and on the lounges around the chamber Senators could be heard discussing the merits of their electric fans, or "buzzers," as they styled them. The demand for "buzzers" became so great that it more than tested the capacity of the dynamo, and in order to supply fans lamps had to be cut out.

A very funny incident occurred in the early part of the Summer of the advent of electricity in the Capitol, with one of the enthusiastic younger Senators. The rush for fans was so great that the supply ran out, and this Senator, knowing a Congressman at the other end of the building who was about to leave the city for the Summer and who had an electric fan in his committee room, went over and borrowed it. A short time after his clerk brought the fan to the Senator's room and both of them immediately proceeded to connect it up. It took nearly a whole afternoon, but without success. It was connected up all right, "made sparks which showed that electricity was at the fan, but the blamed thing wouldn't go." The electrician was sent for, and upon explaining that an alternating-current fan would not work on direct current (at the House end they had alternating current at 1,000 volts primary, and at the Senate end 110 volts direct current), the Senator became rattled; it was too technical for him, and he remarked that he would attend to his statesmanship and permit the electricians to attend to the electrical end of it. Whereupon he sent back the alternating fan.

The page boys have registered a strong kick against the electrical apparatus used in the chamber of the House of Representatives. Heretofore they were all allowed to sit on the steps in front of the Speaker's chair and wait upon members, who indicated by the snapping of fingers or clapping of hands that a page was wanted, and one of them would respond. In these times the boys were associated directly with the members, heard everything, and were many of them statesmen in a small way. "Well," as one of them put it, "we're not as good as hotel bell boys. We are huddled up in this room all day, see nothing and hear nothing except when on an errand, and that is all due to the darn electric annunciator they got in here." In one of the cloak rooms there is an electrical annunciator with numbers, one for each Representative's desk, and now when a member wants a page he simply presses a button at his desk, and as these little fellows say, "we do the rest." This innovation has not taken hold at the Senate as yet. They are too dignified for anything of that sort, and it is against all senatorial "precedent"—and then they have no Reed in this body.

The nearest they have to the electrical page annunciator is an electrical bell in each of the 60 or more committee rooms, and a deputy sergeant-at-arms notifies Senators in their rooms of a roll-call, executive session or adjournment by the pulling of a handle at the side of the Vice-President's desk, one ring indicating a vote, two rings a quorum call, three rings executive session and four rings adjournment. The House of Representatives also has this electrical committe room signal-bell system.

Among some electrical features that have been suggested for the comfort and convenience of our law-makers is the registration by some electrical annunciator scheme of the votes of Senators and Members. It has been proposed that each desk be provided with two push-buttons; one white, meaning "Yea," and the other black, meaning "Nay," which, by pressing, would register a yea or nay vote at the clerk's desk. This proposition was discarded for the reason that some enthusiastic lobbyist, or may be some one not a Member, could, by pushing a button at a temporarily vacated desk, register a vote, and, as Mr. Reed says, "My friends would never have me want for a quorum," or words to that effect.

One of the features of the beautiful marble rooms of the Senate is an immense electrolier representing a basket of flowers, and when illuminated at late evening sessions makes a magnificent display.

As above stated, electric incandescent lights have become popular at the Capitol, and within the past year all gas fixtures have been changed into electroliers. Welsbach lights were tried for several months, with but poor success. Numerous renewals, excessive heat and the sickly green given by them were among the objections made. Within the past year 50 or more long-burning incandescent arc lamps have been placed in and around the grounds of the Capitol.

Mr. Elliot Woods, of the Architect's office at the Capitol, has recently been experimenting with ozone, obtained by an electrical process to be used in the air shafts, by which the fresh air is brought into the building and forced into the two chambers.

GEORGE H. DRAPER.

Washington, D. C., April 18.

Mr. Austin Devoe, of Austin, N. Y., is building a telephone exchange for Fairport, N. Y. A 50-wire switchboard and corresponding apparatus will be put in.

TELEPHONE NEWS AND COMMENT.

The State Board of Equalizers of Tennessee approved the assessment of the People's Telephone Company, of Knoxville, at $45 per mile, made by the railroad commission. This assessment was first placed at $55 per mile.

The Independent Telephone Company, of Kalamazoo, Mich., now has over 600 subscribers. The present switchboard takes care of 600 subscribers. Within the past few days the company has ordered a new board that will accommodate at least 400 more.

Mr. J. E. Keelyn, president of the Western Telephone Construction Company, of Chicago, has just closed a deal for control of the Graham Electric Company's telephone and switchboard business, as well as all of its patents. It is said that this is the fifth concern that has been arranged for in like manner recently. A strong combination seems to be imminent, with Mr. Keelyn as president, and a strong financial syndicate is said to be backing it.

The annual report of the New England Telephone and Telegraph Company for year ended December 31 shows: Gross earnings, $3,097,089; increase, $316,436; net earnings, $660,421; increase, $55,489; surplus after dividends ($569,543), $90,881 against $96,754 in 1896 (dividends, $508,180). President Thomas Sherwin says: "The addition to the number of exchange subscribers during the past year was by far the largest recorded in any year since the company began business. This exceptional increase has been due, in a great measure, to the introduction of the measured service. The expenditure for new construction and properties purchased during the year amounted to $464,765, of which $182,771 was for exchange aerial construction, $129,548 for underground work, $54,176 for equipment, and $98,268 for toll lines. The company has acquired during the past year the property of the Vermont Telephone and Telegraph Company, operating in Montpelier and vicinity." Directors were re-elected, with the exception of William H. Forbes and Mr. Morgan, deceased, who were replaced by Thomas B. Bailey and Winfield S. Hutchinson. The directors re-elected former officers.

ADVANCE INFORMATION

New Telephone and Telegraph Companies.

SILVER SPRINGS, N. Y.—The new telephone line has been completed between this place and Castile, and is now in good working order.

MCMINNVILLE, TENN.—There is a movement on foot to erect a telephone line from this place to Sparta, via several points between that are not on the railroad. This will be of great benefit to those places by placing them in communication with the surrounding country.

WAVERLY, ILL. — Waverly Telephone Company has been incorporated, with a capital stock of $1,400, to operate telephone exchange; incorporators, J. E. Hutchinson, L. D. Foreman, G. E. Prawl.

GERING, NEB.—Thirty-five shares of stock have been subscribed for a telephone line from this place to Kimball, by way of Harrisburg.

ALBUQUERQUE, N. M.—The Albuquerque-Bland Telegraph and Telephone Company, with W. F. Powars as president and manager, has been completed, and is in good working order.

BROCKPORT, N. Y.—Arrangements have been completed by which the Bell Telephone Company will construct a branch line from this place to Hamlin, running north through the village as far as the depot, a total length of five miles. At this place it will connect with the main line, enabling conversation with any part of the country.

TILTON, N. H.—The Citizens' Telephone Company is making preparations to put in a line from here to Franklin Falls. The work on same will probably commence this week.

RUTHERFORD, N. J.—The Bergen County Telephone Company has announced its intention of operating a telephone system in this place and East Rutherford, and has asked the Council's permission to place poles in the streets in both boroughs.

VAN BUREN, OHIO — The Central Union Telephone Company has opened a toll station at this place.

NORRISTOWN, PA. — The Central Telephone Company has been organized, with a capital of $25,000, to operate in Centre, Clinton, Clearfield, Huntingdon, Montour and Lycoming counties.

MIDDDLEBURG, KY.—A telephone line is being erected between Shelby City and Moreland, where it will connect with the Hustonville and Green River line. This place and other Casey towns will be in telephonic communication with all the large towns of Central Kentucky.

BROOKVILLE, IND.—The Frazer Telephone system connecting Connersville and this place has been completed.

CHARLOTTE, N. C.—The Queen City Telephone Company has been incorporated by J. A. Helvin, J. Holt, J. H. and R. J. Gourley; capital stock, $250,000.

VICKSBURG, MISS. — The Vicksburg & Yazoo City Telephone Company has been incorporated.

LEXINGTON, MISS.—The Holmes County Telephone Company has been incorporated.

KINGS MOUNTAIN, N. C. — The Kings Mountain Telephone Company has been incorporated by P. S. Baker, F. Dilling, C. E. Nesler, R. S. Plank and J. S. Manning; capital stock, $1,000.

DANVILLE, PA.—Montour & Columbia Telephone Company has been incorporated.

WILLOW, MICH.—An extension will be added to the Citizens' Telephone Company from Romulus to Wayne and Belleville. Construction will commence soon.

ALBANY, N. Y.—The Rural Telephone Company has been incorporated to maintain a telephone line connecting various towns in Westchester County; capital, $3,000, and directors, R. S. Haviland, Samuel Thompson and C. W. Page, of Chappaqua; W. H. Moore, H. E. Washburn, G. G. Norton and T. B. Pierce, of Pleasantville.

Electric Light and Power.

ST. CLOUD, MINN.—The St. Cloud Water-Power Company has been incorporated, with a capital stock of $25,000. The incorporators are C. A. Wright and W. C. Shaw, of Baltimore, and E. E. Clark and D. T. Calhoun, of this place.

CLARION, PA.—This place will be lighted by electricity by July 1 at a cost of $2,220 a year.

ATLANTIC CITY, N. J.—An ordinance has been introduced granting permission to the Citizens' Lighting Company to erect poles and string wires for the purpose of furnishing electric lights through the city.

BARNSBORO, PA. — The Barnsboro Electric Light Company has been incorporated; directors, Thomas Barnes, George W. Ziegler, Phillipsburg; J. T. Shuger, Chester Hill; John Barnes, this place; Alfred Tucker, Philadelphia.

PHILADELPHIA, PA.—The Gloucester County Electric Company has been incorporated. The incorporators are Thomas M. Latta and M. K. Trichler, of Philadelphia; John Mayhew, Woodbury Heights; Blair Smith, Wenonah; Isaac T. Imhoff, Glassboro; Rudolph McFarland, Monroeville; D. W. Green and Bingham Hood, of Pitman Grove, and David O. Watkins, of Woodbury. The new company has purchased the plant formerly belonging to the Pitman Grove & Glassboro company.

HARPER'S FERRY, W. VA.—J. C. Hanger and R. F. Thompson, of Pennsylvania, are reported to be negotiating for the purchase of the Harper's Ferry Paper Company's power, with a view to the erection of an electric light plant.

JERSEY CITY, N. J.—The De Lery Light Company has been incorporated by E. L. Jones and others; capital stock, $500,000.

GREENVILLE, MISS.—J. M. Lee, City Clerk, may give information concerning electric lighting for the streets.

POCOMOKE CITY, MD.—City Clerk may give information concerning construction of waterworks, sewerage and electric light combined.

NORWOOD, OHIO — The Waterworks and Electric Light trustees have been organized by electing Louis Winkelman, president, and F. C. Hock, secretary.

CHESTER, PA.—E. Stanton Burk, of this city, has been awarded the contract to wire and place electric light in the two new houses that were built by Superintendent Kenney, of the P. W. & B. railroad, at Ridley Park.

BROWNWOOD, TEX.—The Brownwood Ice and Light Company has been incorporated by Brooke Smith, John G. Lee and J. W. Shepard, to supply light, electric motor power and to manufacture ice; capital stock, $30,000.

New Electric Railways.

COXSACKIE, N. Y.—Ground has been broken for the trolley road from this place to Middleburgh.

DAYTON, OHIO—It is announced that the Dayton & Western Traction Company will have its line in operation between this place and Eaton by June 1.

BRUNSWICK, N. J.—A franchise has been granted to the Brunswick Traction Company for their connecting line between Dunellen and Bound Brook.

SEYMOUR, PA. — A charter has been issued to the Seymour Street Railway Company, to run an electric line five miles long in Winton, Lackawanna County. The capital is $30,000, and J. F. Commings, George Dando, James Bell and P. S. Welsh, Winton; W. G. Robertson, Dunmore, and C. P. O'Malley, Scranton, are the directors.

MCKEESPORT, PA.—The Highland Grove Traction Company has been incorporated, with a capital stock of $12,000.

MCKEESPORT, PA.—The Highland Grove Traction Company has been incorporated; capital, $12,000.

ATHENS, OHIO—Another route will be surveyed for the Brice Line extension from this city to Newcastle. It will be an air line.

ASHTABULA, OHIO — Pennsylvania & Ohio Railway has been granted a franchise to conduct an electric line from Unionville to Conneaut, through Geneva, Ashtabula, Kingsville and Saybrook. Construction is to be begun at once.

DANVILLE, PA.—A trolley road is likely to be built between this place and Bloomsburg this Summer.

VICKSBURG, MISS.—The electric railroad has secured franchise to build its line in the city and suburbs.

LIMA, N. Y.—Ground has been broken for the construction of the electric light and trolley system for this place.

CONCORD, N.H.—The Berlin Street Railway has filed its locations with the Secretary of State. Its capital stock is $15,000.

DUNKIRK, IND.—An electric street railway line will be constructed from this place to Redkey and Camden.

ST. LOUIS, MO. — The Central Traction Company has been organized by R. N. Snyder and others to build a street railway.

GREENSBORO, N. C.—An electric street railway is to be constructed; S. H. Haughton and others are interested in the enterprise.

ST. LOUIS, MO.—The North & South Electric Railway, of which John H. Blessing is president, will construct an electric railway.

BALTIMORE, MD.—The Baltimore City Passenger Railway Company will remodel two cable power-houses into electric power-plants.

New Incorporations.

ST. LOUIS, MO.—The Old Hickory Electric and Construction Company has been incorporated by Frank F. Sopp, Hiram Cole, J. C. Terry, F. M. Estes and J. H. Robertson; capital stock, $50,000.

HUDSON, N. Y.—The Jansen Kill Electric Power Company has been incorporated. The corporators are William A. Harder, Jr., Philip M. Harder and Charles N. Harder. It is proposed to construct and operate a series of dams and reservoirs in Columbia and Dutchess counties for developing and furnishing hydraulic and electric power for manufacturing and other purposes, and transmitting such power to a distance by electricity or other means, to Hudson and other places in the counties specified. The capital stock of the corporation is placed at $100,000.

Increase of Capital.

HAMILTON, OHIO—The Hamilton Belt Line Railway has increased its stock from $25,000 to $50,000, and the immediate construction of the road is determined upon. The road will start in from a C., H. & I. connection, near the MacNeale & Urban Safe Works, up to the old Eaton pike, east, bordering along Two-Mile Creek, striking the Seven-Mile pike and thence down parallel with the pike to Semler's mill. Work on the road will commence in three weeks.

A New Porous Cup.

There are many articles which to all appearances seem good, and there is nothing more deceptive to the uninitiated than a porous cup. The interior of a porous cup may be filled with nothing but carbon or an inferior grade of manganese and carbon, or the porous cup itself may be too hard in certain parts and not allow the solution to penetrate evenly.

A NEW POROUS CUP.

The Western Electric Company, of Chicago and New York, is manufacturing a porous cup in which the ingredients and parts used are subjected to a careful test and examination before acceptance; the cups are examined for their porosity, the manganese and carbon for their purity, and all details of workmanship are executed with the greatest care. This porous cup is marked No. 6, and, owing to the excellency of its manufacture and the high grade of the material used, its recuperative power is of the highest.

INDUSTRIAL NOTES.

The Sterling Electric Company, Chicago, has in press a handsome folder with all the company's devices in the way of telephone exchange and line equipment illustrated and described. It will undoubtedly prove of interest to all exchange managers, and those who may be overlooked in the mailing should not fail to send for a copy.

The Crofton Storage Battery Company, Chicago, although in business but a short time, has already found it necessary to increase its factory capacity, and has secured additional floor space in the building occupied. Some important changes in the structural details of the battery plate, recently applied by Mr. Pumpelly, will make the battery still more efficient and reliable.

Western Telephone Construction Company, Chicago, again has found it necessary to increase its floor space to take care of the rapidly increasing business. The entire floor below the premises heretofore occupied has been leased and will be arranged for offices, shipping room and testing department, giving the manufacturing department proper some 33⅓ per cent more room. More machinery is, of course, necessary and on the way. President Keelyn may well be proud of the splendid and substantial business he has built up in a comparatively short time, by successfully catering to the demands for reliable apparatus, and by persistently protecting the company's patrons in the use thereof.

A Leading English Electrical House.

Messrs. Laing, Wharton & Down, Limited, of London and Leeds, England, electric light, power and traction engineers, are one of the oldest British houses for electrical work of all classes, and have, since very early days, been connected with American manufacturers and inventions.

About 10 years ago Mr. Wharton, of the concern, visited the United States, and as a result determined to introduce the manufactures of the Thomson-Houston company (now the General Electric Company) to Great Britain and her many colonies, and his efforts met with so much success that this work had to be turned into an independent concern, first under the name of the Laing, Wharton & Down Construction Syndicate, and then, as it expanded still more, into the British Thomson-Houston company as it now exists.

Having successfully fathered so important an undertaking as the British Thomson-Houston company, it was determined to pioneer the Walker traction apparatus in Great Britain to see if it would lend itself, in the face of the very keen competition in Great Britain, to obtaining a leading position, and under vigorous pushing at the hands of Mr. Down and Mr. Justus Eck, M. A., orders have been obtained for generators and motors, etc., for use in such important towns as Glasgow, Halifax, Leeds, Menstone, etc., and it is hoped the result of these efforts will bring a large connection in England.

Electric traction being much to the front in England has led this house to develop a department for this class of work under the expert advice of Mr. Justus Eck, who undertakes the duties of engineer-in-chief and managing director to the company. In this department the sale and construction work is both carried out, and among American goods of the highest class dealt in are car bodies and trucks by the well known J. G. Brill company, Okonite cables and tapes made by the Okonite Company, lightning arresters by the Garton Daniels company, of Keokuk; copper bonds of almost every make, such as "Chicago," "Protected," "Columbia," etc., commutator segments of the "Roll-Drop" type, Pearson jacks, Buda and Paulus rail drills, etc.

In the department of electric lighting Messrs. Laing, Wharton & Down are also well abreast with the times and daily enter into contracts for the erection of installation of arc and incandescent lamps and the required generating machinery—in fact, they have on their books at the moment over 1,100 complete installations. Connected with this department is an extensive factory for the manufacture of switchboards, switches, special apparatus and repairs, and from this shop have originated large quantities of central station high-tension apparatus.

Last year Mr. Justus Eck spent two months in the United States making his headquarters with the Okonite company in New York. He took the opportunity of visiting most of our leading cities, more especially studying the electric traction work to be found in them, and as a result his company has in execution in England a large number of orders for all kinds of apparatus for traction work.

FOR SALE . . .

One 150-h.-p. Single-Cylinder Ball & Wood Engine, 16 x 16, 250 R. P. M. In first-class condition.

Two 60-k.-w. Edison Bi-polar Dynamos, in A No. 1 order.

One 60-inch 3-ply Leather Belt, 96 feet 0 inch long. Run but a short time.

For further particulars, address
J. F. OUTWATER,
360 Pearl Street,
Brooklyn, N. Y.

A BARGAIN.

We have for sale a 25 horse-power horizontal engine (Nagle, Erie, Pa.) and boiler for same; only used a short time; good as new. Will be sold low.

Address A. H. Potts & Co.,
Parkesburg, Pa.

IRON ROOF FOR SALE.

Width of building, 155 ft., out to out, divided into a center span 66 ft., with a wing on each side 43 ft., 6 in.; total length of the building, 350 ft. This building is designed with brick sides and gable walls, with iron roof trusses and iron supporting columns; originally built for an iron foundry, but owing to the failure of the purchaser is now offered for sale at a bargain. Is admirably adapted for a foundry for light or heavy castings, machine shop, car barn, or for any other general manufacturing purposes. We guarantee the iron work as good as new, building never having been used.

Apply to
THE BERLIN IRON BRIDGE COMPANY,
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You have Abandoned your Trip to Europe.

You want to get your family away from the sea coast and Spanish flotillas.

You have been abroad. You know all about **Europe** and the **Continent.** Why not see your own **GREAT WEST?**

The climate and attractions of the **PACIFIC COAST** are delightful in summer as in winter. **GO THERE.**

Visit **COLORADO** en route. The mountains of **Switzerland** are no grander. Take in the **GRAND CANON** of the **COLORADO RIVER** in **ARIZONA.** This is to scenery abroad what daylight is to a candle.

Be patriotic and learn something about your country.

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THE ATCHISON, TOPEKA & SANTA FE RAILWAY Agents can give you all the facts regarding this Western trip.

E. F. BURNETT, E. P. Agent,
377 Broadway, N. Y.

Bargains in Dynamos, Engines, Etc.

Direct-current dynamos of 350, 700, 725, 800, 810, 900, 1,075, 1,350, 1,610 and 2,500 light capacity.
Alternating-current dynamos of 750, 900, 1,800 and 2,000 light capacity.
Arc dynamos, 20, 24, 30, 40, 50 and 60 lights, both 1,200 and 2,000 candle-power.
Engines, 50, 75, 85, 100, 115, 125, 150, 175 and 200 horse-power.
Boilers, 100, 250, 375 and 500 horse-power.
Heaters, 150 and 2,000 horse-power.
Pumps, all sizes.

Write us for Price-list No. 21.

This apparatus has been removed from our own Central Stations to make room for larger units. We therefore know its history and can guarantee it to be in thoroughly good operative condition.

CHICAGO EDISON COMPANY, 139 Adams St., CHICAGO.

Kindred.... ...Interests

The Technic Electrical Works, of Philadelphia, is sending out a pocket price list of isolated plant switchboards and knife-switches. The lists are quite complete and concise.

A new catalogue, finely illustrated and a work of art in its entire make-up, is about ready for distribution by the American Stoker Company, Washington Life Building, New York city. Copies may be obtained by parties interested, upon application.

The Central Electric Company, of Chicago, are sending out with their compliments a detailed comparison of the United States Navy with the navy of Spain. The following sentence appears in red ink: "Since printing this list there has been a change in Spain's equipment—it's smaller—thanks to Admiral Dewey."

The Electric Storage Battery Company, through Mr. Charles Blizard, manager of the company's New York office, is sending out a set of five thumb tacks carrying an advertisement of the chloride accumulator. The thumb tacks are covered with celluloid and form a serviceable and attractive advertising novelty.

Mr. Chas. E. Perring, designer and maker of gas and electric fixtures, has associated himself with the well known firm of Cassidy & Son Manufacturing Company, West Twenty-third street, New York. The house has an enviable reputation for artistic excellence of designs, together with the perfect workmanship and finish of goods.

The Western Electric Company has designed fan motors that are to be connected up directly with 220 or 550-volt circuits without the intervention of any resistance. This company also states that three of its 110-volt motors or two of its 220-volt motors can be run in series on 500-volt circuits, and the 550-volt motor can be placed on 600-volt circuit.

The Falls Rivet and Machinery Company, of Cuyahoga Falls, Ohio, has issued a catalogue and price list "A" describing its power transmitting machinery. The new catalogue is well prepared and well illustrated, and contains many facts of value to users of power. The ELECTRICAL REVIEW understands that this catalogue can be had free on application.

The Central Electric Company, Chicago, are introducing a new and very ingenious device for ceiling clusters, consisting of a porcelain block, with a metal canopy, which attaches directly to the ceiling, and having the sockets embodied as a component part of the fixture. They are furnished in various sizes from two to five lights, and are specially designed for street-car work. Special circulars relating to this device will be sent on application.

The Lee-Penberthy Manufacturing Company, of Detroit, Mich., has issued a "Manual of Useful and Valuable Information," compiled by William O. Lee. Besides giving a great many facts concerning the injectors and steam appliances manufactured by this firm, the manual contains information on railroads, pipe tables, discount tables, etc., arranged in convenient form for users, sellers and manufacturers of steam appliances. The manual is worthy a place in any library.

The Westinghouse Electric and Manufacturing Company is building two three-phase belt-driven generators, 500 horse-power each, 3,000 alternations, 2,400 volts, for the Canadian Niagara Power Company at Niagara Falls. The success of the 5,000-horse-power machines, built for the Cataract Construction Company, has encouraged others to enter the field for harnessing Niagara, but, like the pioneers, many of the newcomers go to the Westinghouse company for the apparatus.

The Electrical Exchange, Chicago, report great success with their new agency, the Midget Upton arc lamp. They have already secured orders for a large number from all parts of the country. One shipment was sent to St. Michaels, Alaska. In addition to the regular line of Midget Upton lamps, the Exchange is putting out a new Midget Upton alternating lamp, which is meeting with great success. The Exchange carries a full line of these lamps in Chicago stock, and would be pleased to have prospective purchasers call and examine the various samples now on exhibition.

Probably one of the most useful and interesting books on insulation ever gotten out is now being mailed to the electric street railways and electrical manufacturers throughout the country by the Mica Insulator Company, of New York and Chicago. The book is made up of several pages of reading matter, each one of which, aside from the title and index pages, is descriptive of the "sample of insulation" preceding it. The company will be pleased to mail upon application to those who are users of high-grade insulators a copy of this manual on insulation, and also call attention to the fact that their materials are carried in stock, both at New York and Chicago.

The Economic Power Company, of Rochester, N. Y., have, in the past week, placed orders with the American Tool Works Company, of Cincinnati, Ohio, for a number of lathes, planers and milling machines, which will be placed in their shops at Indianapolis, Ind. The American Tool Works Company have also received, through their office at St. Petersburg, Russia, orders for lathes, planers, shapers, drill presses, milling machines and bolt cutters, which will be placed in the locomotive works in that city. Through their office at Stockholm, Sweden, were received orders for a full line of engine lathes, ranging in swing from 14 to 30 inches. Increased activity in Mexico has resulted in an increase of inquiries and orders from that country, the company having sold a number of large orders there in the past two weeks, among them being one from Compañia Agricola del Tlahualita, Limited, at Zaragoza, Mexico, for a number of planers, lathes and shapers.

Lubrication of Gas Engine Cylinders—The proper lubrication of gas engine cylinders has been a very difficult problem. The problem, however, seems to have been very successfully solved by an official of the Pennsylvania Railroad Company. He writes as follows: "I had a gas engine at Sharon, Pa., running a pump, and the man that had charge of it allowed the lubricator to run dry and cut the piston, piston rings and cylinder. The makers of the gas engine said the cylinder would have to be sent to the shop and bored out and a new piston put in. It was our busy season, and we could not do without water. I had some of Dixon's finely pulverized graphite, and I commenced to feed it into the cylinder through the suction pipe with the air and gas, with immediate relief. After about two weeks the engine was running smoother and using less gas than ever before. I had this same engine apart last Saturday, and every place that was cut is smooth as glass. This one instance saved us about $75. I have great faith in this graphite and always keep it on hand."

J. G. WHITE & COMPANY,
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THE AKRON INSULATOR AND MARBLE COMPANY,

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HIGHEST GRADE INSULATORS AND ELECTRICAL CLAY SPECIALTIES OF ALL KINDS.
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For our free book, entitled "Can I Become an Electrical Engineer?" address
The Electrical Engineer Institute of Correspondence Instruction,
CONDUCTED UNDER THE AUSPICES OF "THE ELECTRICAL ENGINEER."
Herman A. Strauss, E. E., General Manager. 120 Liberty Street, New York, U. S. A.

Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED MAY 3, 1898.

603,263 Process of and apparatus for electrolytic tanning; Ed Davis, Philadelphia, Pa.

603,270 Automatic electric fire-alarm; W. E. Frost, Lewiston, Me.—Consists of a shell or case having an air chamber and a co cave or sunken drumhead or diaphragm, a movable float circuit-closer arranged centrally within said case or shell and loo-ely supported on said diaphragm, a stationary electrode metallically connected to said case or shell and circuit wires connected respectively to said electrode and float circuit-closer.

603,283 Electric arc lamp; T. H. Pettengill, Amsterdam, N. Y.

603,286 Electro-plating apparatus; Louis Potthoff, Flushing, N. Y.—Consists of a bath, a frame contained therein and comprising side-bars, bearings and cross-bars, a plurality of shafts, rollers located on the shafts between the side-bars of the frame, and one or more guiding combs of conducting material for guiding the wire, one or more anodes and circuit connections for the anodes and combs.

603,317 Solar apparatus; W. Calver, Washington, D. C.—A curved track, a car thereon, a reflector within the space bounded by the track, and an object mounted upon the car to travel across the same and to receive the rays from the reflector.

603,334 Electrical attachment for gas lights; F. L. Kellner, Philadelphia, Pa.

603,389, 603,390 Electric signal system; L. C. Werner, Broad Brook, Ct.

603,383 Electric arc lamp; A. W. Knutson, Galesburg, Ill.—A clutch for electric arc lamps having a clutch-arm formed with an obliquely disposed rod opening piercing one side of the arm to permit of the carbon rod passing laterally into said opening, one of the inclined walls of said opening being provided with a clutch notch.

603,450 Electric programme clock; J. O. Lyman, Waterbury, Ct.—Consists of a rotatable perforated dial, a contact plate behind said dial, a series of fingers pivoted below said dial and bearing weights and an arm, a series of cams to engage and operate said arms, means for intermittently rotating said arms, means for intermittently rotating said cams in a manner to successively lower and raise the fingers.

603,499 Art of making plates for electric battery purposes; A. C. Croftan, Chicago, Ill.—The improved method of forming spongy lead plates, which consists in forcing molten lead through a series of small orifices and allowing it to pile up just before solidifying upon a horizontally vibrating surface.

603,515 Electrical apparatus; William Stanley, Pittsfield, Mass.—Consists of two coils in series with each other and with a source of alternating current, in combination with two shunts, one of less, the other of greater, time-constant than the coils which they respectively shunt, and a closed-circuited armature in direct inductive relation to the fluxes produced by both coils.

603,524 Electric dental-engine controller; J. J. Coachman, Rio Janeiro, Brazil—A controlling device for an electric motor, comprising in connection with an electric circuit, a series of contact strips, a pedal movable over the same and carrying contacts, a resistance coil, a contact point carried by the pedal for engaging with the resistance coil and a pole-changer electrically operated.

603,594 Time-limit cut-out; H. H. Cutler, Chicago, Ill.—Consists of an active coil of a cut-out and a time-limit controlling the same and comprising a section of an electric circuit, the resistance of which varies with rise of temperature due to the current.

"Lightning Arresters" is the title of a short treatise from the press of the General Electric Company, descriptive of the devices which it has developed for preventing injury to electrical apparatus by lightning. The introduction is a short examination of the qualifications necessary to a perfect lightning arrester, with a short disquisition on the special advantages of the magnetic blow-out. This is followed by concise descriptions of the arc and incandescent station arresters, already well known as types "A," "AA" and "B." Greater space is given to the more recently developed lightning arrester for direct-current circuits up to 850 volts, and to the General Electric short-gap arrester, especially designed for alternating-current circuits, and in use on almost all of the great electric power transmissions of the West. The booklet is well written and printed, the illustrations are excellent, and the diagrams of connections clear and distinct. We understand that "Lightning Arresters" will be furnished by the supply department of the G. E. Co.

Time saved, Travel avoided, Telephone does the business.
New Telephone Directory goes to press June 1st. Make your contracts this month.
NEW YORK TELEPHONE CO.,
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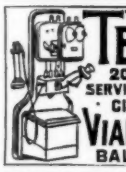
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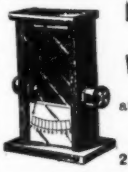
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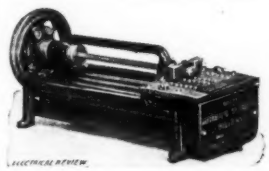
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It is now nearly four and one-half years since the close of the great World's Columbian Exposition, held in Chicago. Every vestige of the famous electrical display at which the people gazed and wondered has disappeared. The people have gone, the buildings have been removed, the drives and walks changed and the Exposition grounds once more transformed into a beautiful park.

Electricity at the Columbian Exposition, however, lives not only in the memories of the people who have seen it, but also in a more substantial form in the shape of a five-hundred-page book compiled by John P. Barrett. This book, "Electricity at the Columbian Exposition," contains eighty-four handsome full-page illustrations, sixteen of which show exterior views of the buildings at night. The brilliant illumination of the buildings by both incandescent and arc lights made it not only possible to photograph them after nightfall, but also gave unique and artistic results. Seventeen of the full-page illustrations are general views giving pictures of the fountains and statuary, and there are also fifty full-page pictures of the various exhibits.

The paper used in this book is finely finished enameled book paper, which allows for the best effect in printing illustrations. The text is generally descriptive of the various exhibits and of the buildings, and also contains several reports of the expenses and the operation of the intramural railway, and several short historical introductions to the descriptions of the various departments of electricity.

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THE ELECTRICAL SHOW.

(Concluded from page 302.)

duit is known as the "Three-Eye" conduit.

The Garvin Machine Company, New York, is well represented at the Exposition building by Mr. H. W. Holbrook, who is glad to receive patrons or friends of the company.

The Stephenson Car Company, New York, have been instrumental in preparing what by many is said to be the most interesting feature of the exposition. A car such as is now used on the electric conduit system by the Metropolitan company has been mounted on a platform of perhaps 200 feet in length. The complete details for running have been carried out so that the car is moved forward and back by the operator, permitting all the connection to be seen. While the Stephenson company furnished the car, the J. G. White Company, engineers, of New York, are the superintendent of engineering construction; the Johnson Company, of Lorain, furnished the rails; the H. B. Camp Company, Aultman, Ohio, the conduits; the Roebling's Sons Company the cable, and a fender of the Providence type is used.

Mr. H. B. Kirkland, New York representative of the Cutter Electrical and Manufacturing Company, Philadelphia; the Hope Electric Appliance C mpany, Providence; American Circular Loom Company, Boston, and Charles Wirts, Philadelphia, has arranged an exhibit of the products of the several companies which he represents.

Henry R. Worthington, New York and Brooklyn, has one of the largest spaces on the main floor, in which are shown their many styles of pumps for various adaptations; also all the electrical machinery which is used in connection with pumping, including controllers, rheostats, etc. Electric pumps of larger sizes are connected to electric motors, and are shown in operation.

The Edison Manufacturing Company of New York are exhibiting the "Edison" battery fan outfit in connection with the Edison-Lalande batteries, Edison X-ray machines, Edison machines for electro-therapeutic work, also other lines of apparatus which this company produce.

The Keuffel & Esser company, New York, show drawing and surveying instruments.

The Peru Electric Manufacturing Company, Peru, Ind., show an elaborate line of insulators of varying sizes up to the highest potential, also types of the "Peru" cut-outs and the different types made by them of the "Peru" branches and mains, Edison branches and mains, transformer fuse plugs, insulators, cleats, rheostats, switches, and the many forms into which they make porcelain for electrical purposes.

The Warren Electric and Specialty Company, makers of incandescent lamps, Warren, Ohio, have placed their exhibition interests in the hands of Mr. Elmer P. Morris, the manager of their New York office. Also Mr. J. W. Holloway, from the home office, is at the Exposition.

The National Carbon Company, Cleveland, Ohio, are showing a line of carbon products which include carbon specialties for every feature of electrical use.

Thomas A. Edison, Jr., New York, has prepared a large circular arrangement of the Edison, Jr., lamp. The lamps are placed in diameter with separate connections for each set of lamps. The sets of lamps are of different voltages, candle-power and wattage, with the necessary implements to test the lamps. The exhibition is one of the most striking in the way of illumination in the Garden.

The Armorite Interior Conduit Company, Pittsburgh and New York, are showing the well known "Armorite" conduits.

The Bossert Electric Construction Company, Utica, N. Y., have a well arranged showing of boxes of all kinds which are used with conduits. Mr. George H. Draper is in charge.

The American Pulley Company, Philadelphia, show a line of the American pulleys which were described some weeks ago in the ELECTRICAL REVIEW.

The Niles Tool Company, Hamilton, Ohio, have a space filled with heavy machinery made in their own factory.

The American Rheostat Company, Milwaukee, Wis., have an exhibit containing a three-horse-power 500-volt automatic starter and a 20-horse-power 230-volt overload starter, also a starter of a different size connected to the Eddy motor. In addition to these, they have a two-horse-power 230-volt reversible printing-press controller, a five-horse-power 220-volt rheostat, a 10-horse-power 230-volt elevator controller, and a 40-kilowatt 125-volt field rheostat.

ELECTRIC LIGHT FLASHES.

The plant of the Fenton Electric Light and Power Company, of Grand Rapids, Mich., has been sold to Fayette L. Thompson, of Lansing, for $7,000.

Bloomfield, Pa., Council has granted a Newport company an electric light franchise for 20 years. The project of the company is to light the three towns of Bloomfield, Newport and Millerstown from a plant located in Newport.

At the annual meeting of the Martinsburg, Md., Electric Company the following officers were chosen: W. E. Tebo, president; W. W. Houseworth, secretary and manager; George M. Busey, treasurer. It was decided to expend about $1,200 for new dynamos and engines.

The Pittsfield, Mass., Electric Company has been granted the right to issue $25,000 additional stock and $100,000 bonds by the gas and electric light commissioners. The bonds are to be of the five per cent, 10-year variety, and $75,000 will be issued for the purpose of taking up existing bonds and $25,000 for new improvements. The $25,000 stock is to pay floating debts.

The La Porte Telephone Company, of La Porte, Ind., have recently changed from an automatic system to a manual central board exchange. They had less than 150 subscribers, but put in a 300-wire Stromberg-Carlson switchboard and distributing board. The greatly improved service is bringing in many new subscribers, and at the present outlook the exchange will be nearly doubled in the very near future.

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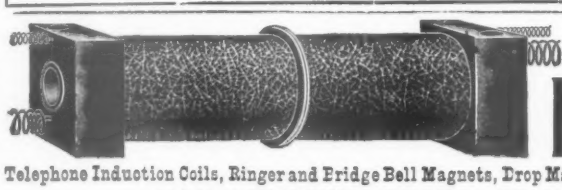

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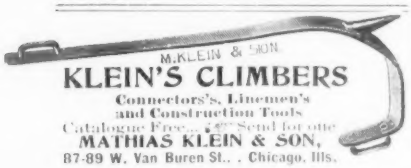

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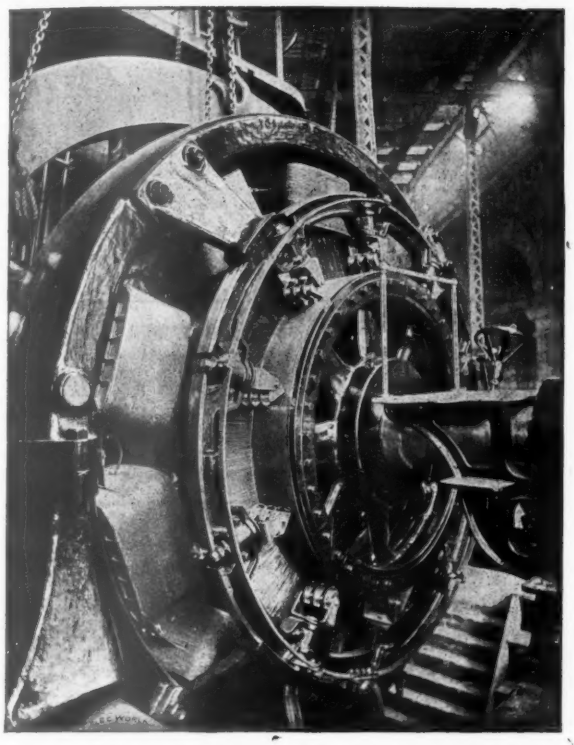

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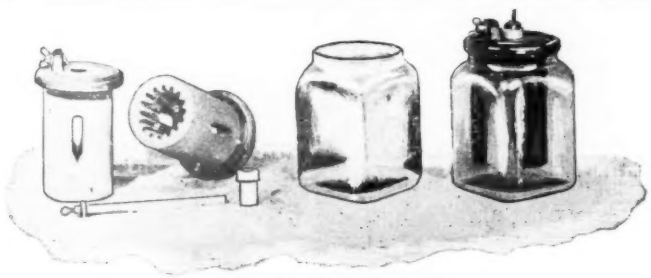

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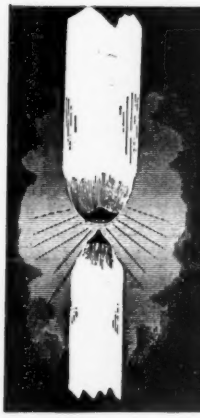

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